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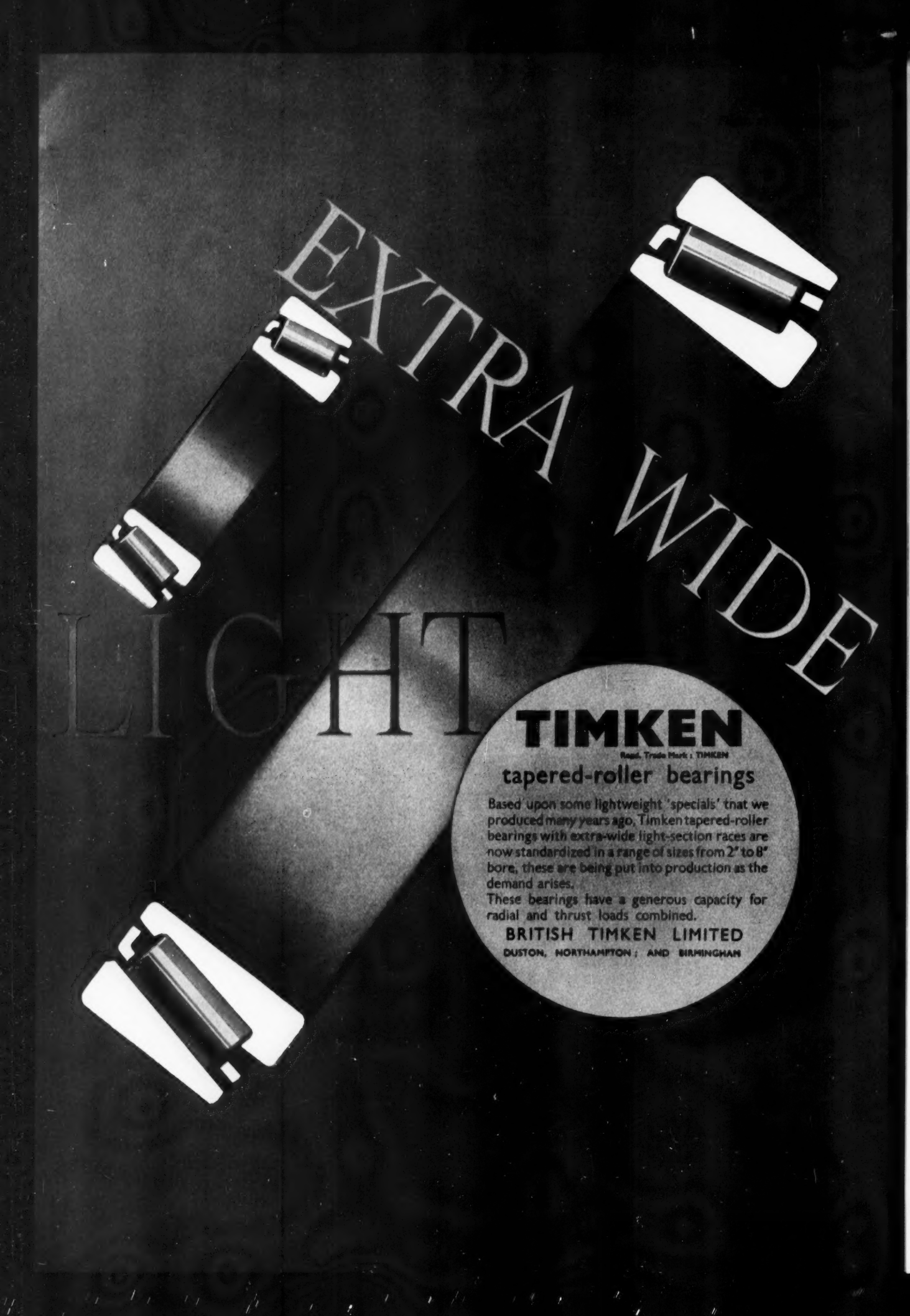
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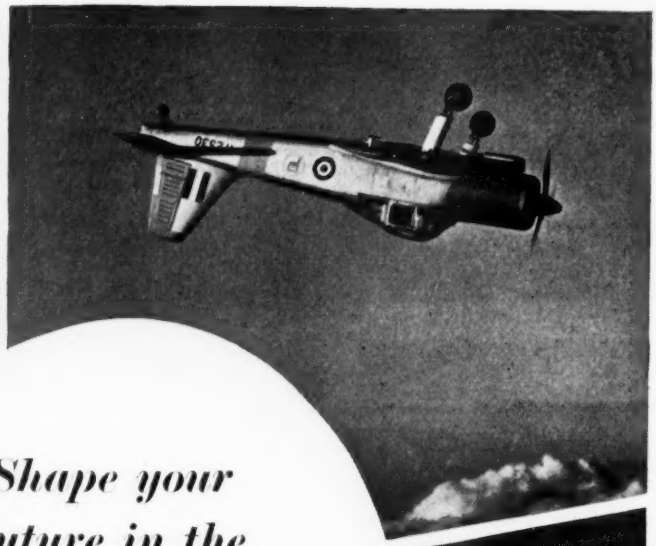

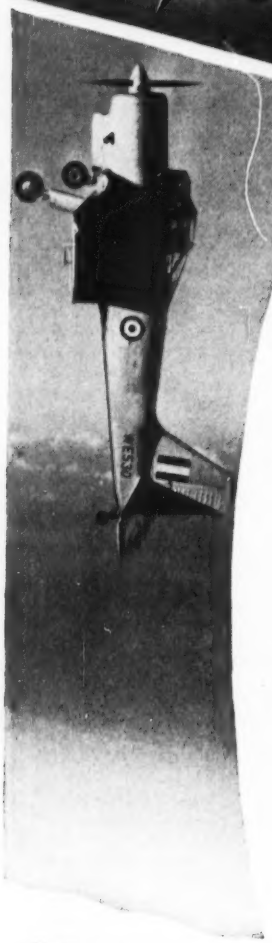

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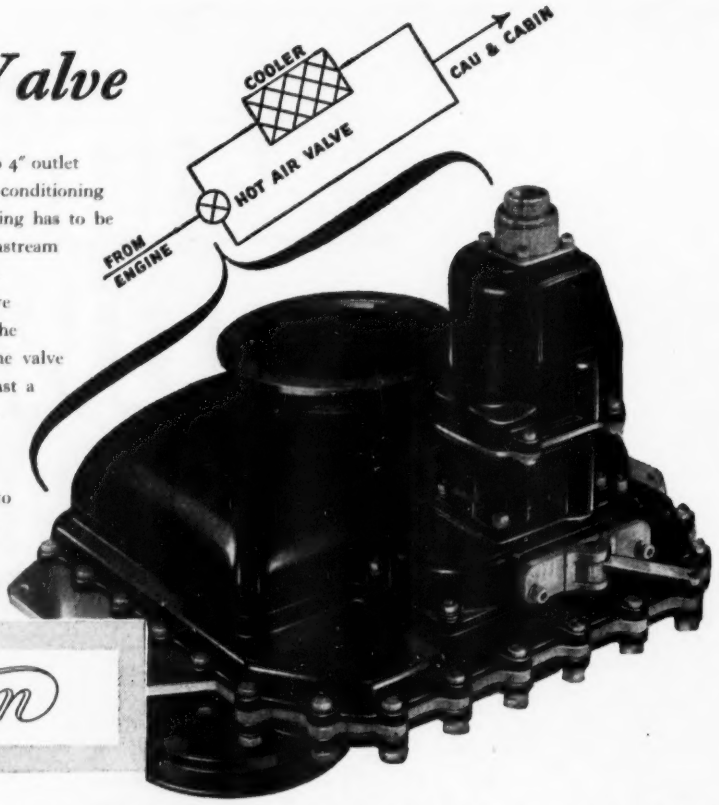

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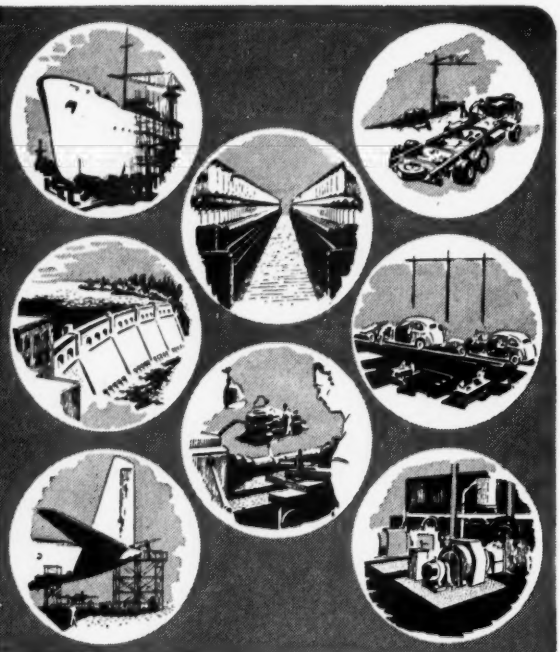

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No. 2301 Vol. LXIII. FRIDAY, 27 FEBRUARY 1953

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STAMFORD STREET,
LONDON, S.E.1

Telegrams, Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

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Times Have Changed

NEARLY forty years ago the forerunner of today's Valiants, Vulcans and Victors, the H.P. 0/100 heavy bomber, was specified, the design submitted to and approved by the Director of the Air Department of the Admiralty, and the first of a long series of machines built forthwith. The details of this achievement are recalled in the latest article (on pages 254-259) of our historical series. The 1914 procedure, it seems, was remarkably similar to that employed today. But there was one striking difference: the twin-engined 0/100, with wing span of 100ft, made its first flight in under twelve months from the time the specification was issued. Elsewhere in the same article is the remark that the alteration of tailplane incidence on the ground (this aircraft did not have a "flying tail") was a task not to be undertaken lightly—it entailed five or six hours' work!

Time being entirely relative, it is perhaps surprising that so much of it should nowadays have to be devoted to the precise estimation of how long and when, and that such important decisions should have to depend on the answers. Recently there have been new debates on defence and production, both military and civil, in the Lords and Commons, and from these it is once again made apparent that correct timing is of paramount importance. The Lords debate, in particular, indicated that dangerous equipment-deficiencies may arise from inability broadly to foresee military aircraft requirements well in advance; from failure to place orders in good time; and, ultimately, from any indecision or lack of co-ordination which prevents a design from being frozen and production started.

Were design and production facilities unlimited and expense no object, the job of providing aircraft and armament for R.A.F. and Navy Squadrons would perhaps be a little less difficult. Where there was doubt "insurance orders" might be placed for several types. But even this would no longer make for wholly plain sailing, because the most difficult job of all for the industry and the Government today is to decide what kind of aircraft to make. Once again it is the time element; by the time a selected bomber or fighter design has become a production-line it may not just be obsolescent, but actually unable to compete at all under the changed conditions. Indeed, there are many who believe that we have already seen the last of the intercepters and high-altitude bombers, and that when the fully developed Hunters, Swifts and Vulcans are replaced it will be with missiles. What is true of the aircraft is true of their weapons: guns, whatever their calibre and muzzle velocity, are certainly on the way out so far as fighter armament is concerned.

Unprecedented scientific advances are thus forcing upon the governments of the world more difficult decisions in more difficult times than they have ever had to face before. While doubt remains as to the chances of peace being preserved certain fundamental questions will require answering. For example, to what extent will atomic power decide a war? or again, because excessive expense on armament may bring economic collapse, what can we do without? Can we depend upon the development of several kinds of guided missile to be rapid enough to begin to displace first-line aircraft within the next five to eight years? If the answer to this third question is yes, new specifications for manned fighters and bombers are already a thing of the past. Who would not hesitate when confronted with such formidable and recurrent questions? Yet to hesitate for long could prove fatal.

Passages in the Defence White Paper (see page 242) which relate to such matters state that our objectives have not changed; it is the means of achieving them and the rate at which we can progress towards their achievement to which the Government has given close attention. We must avoid committing ourselves too deeply to equipment which will have to be replaced at heavy cost within a relatively short space of time, states the White Paper, and we must balance the need for greater defence strength against the risk that by overstraining ourselves we shall be faced with economic collapse. So far as R.A.F. production is concerned, aircraft still represent by far the largest item, while aircraft gun ammunition and bombs are main items under the 1953/4 explosives programme. On the other hand, the £100 million expenditure on research and development, 40 per cent more than last year, includes guided weapons among its "more expensive elements."

THE DEFENCE WHITE PAPER

Air Vote Increased in 1953-54 Estimates

ESTIMATES for the year 1953-54, as published last week in the new White Paper On Defence,* show that the Air Ministry vote has been increased to £548 million compared with £467.6 m in 1952-53. Neither figure allows for counterpart receipts; otherwise the totals would be £498 m and £437.6 m respectively. The total Defence Estimates for 1953-54 amount to £1,636.76 m, it is stated, compared with total estimated expenditure in 1952-53 of £1,513.5 m, including the Supplementary Estimates presented in January.

These, in brief, are some of the outstanding statistics recorded in a White Paper which carries a stage farther the narrative of Britain's defence programme. Attention is drawn at the outset to the "searching review" during the past year of defence policy and of the rearmament programme as a whole. The review is now being carried further forward, it is stated, with the object of formulating our defence policy in the longer term, in relation to the probable international situation, the country's economic prospects, and the advent of new weapons and techniques. In the formulation of that policy, account is to be taken of our obligations as a member of NATO and of our position in the British Commonwealth and Empire.

The following passage then occurs in the White Paper: "Though it has been necessary in the face of economic circumstances to modify previous plans . . . there has been no change in the determination of the Government to put forth their utmost efforts to strengthen the defences of the United Kingdom, of the North Atlantic Treaty area with which those defences are indissolubly linked, and of the whole free world. Only if we are strong can we achieve our supreme object of preventing a third world war. If the risk of war has receded in past months, the cause has been the growing power of the Western nations; but there is still much to do before that strength will be sufficient, and the effort must continue."

Consideration is then given to the general aspect of the defence effort, which might be summarized as measures to deal with both an existing "cold" war and a potential "hot" one. Into the second category, it is mentioned, fall the re-equipment of the armed forces, the expansion of the Royal Air Force, and the building up of reserves of men and material.

The statement goes on to note that, while the objectives have not changed, the means of achieving them and the rate at which it is possible to progress are such that it is specially important, in the prevailing times of stringency, to get the fullest possible value for money. Emphasis is placed on the danger of committing the programme too deeply to equipment which would have to be replaced at heavy cost within a relatively short space of time, and on the importance of balancing the need for greater defensive strength against the risk of economic collapse. It was on such considerations that the policy embodied in the defence budget for 1952-53 had been founded.

Tables showing the estimates in detail are then reproduced:—

	Original estimate 1952-53 (£m)	Supplementary estimate 1952-53 (£m)	Total 1952-53 (£m)	Estimate 1953-54 (£m)
Without counterpart receipt allowance:—				
Admiralty	357.3	3.0	360.3	364.50
War Office	521.5	35.0	556.5	581.00
Air Ministry	467.6	Nil	467.6	548.00
Ministry of Supply	98.5	13.3	111.8	123.75
Ministry of Defence	17.3	Nil	17.3	19.51
Totals	1,462.2	51.3	1,513.5	1,636.76
With counterpart receipt allowance:—				
Admiralty	332.3	3.0	335.3	329.50
War Office	491.5	35.0	526.5	526.00
Air Ministry	437.6	Nil	437.6	498.00
Ministry of Supply	98.5	13.3	111.8	123.75
Ministry of Defence	17.3	Nil	17.3	19.51
Totals	1,377.2	51.3	1,428.5	1,496.76

Notwithstanding the adjustments which had had to be made in order to maintain the strength of the economy—on which the defence programme must ultimately depend—a further very substantial contribution towards the modernization, re-equipment, and expansion of the Services would be made in the coming year; expenditure would be at a level unknown before in peace-time and would increase further above the 1952-53 total.

The White Paper then deals with finance, and mentions that the total Defence Estimates include provision for expenditure of £140 million of sterling counterpart of defence support aid, provided in dollars by the United States of America. That sum has been allocated as follows: Navy, £35 million; Army, £55 million; Air, £50 million.

It is mentioned that a substantial part of the increase in the Defence Estimates for 1953-54 as compared with 1952-53 (not allowing for counterpart receipts) was accounted for by rises in costs, while, in addition, certain items of defence expenditure had been transferred to Service votes from those of civil departments.

Dealing with manpower, the White Paper alludes to a general increase during 1952 in regular recruiting to the active forces, but states that regular recruiting to the R.A.F. on long-term engagements in 1952 had been disappointing. Very good results had been achieved, however, in respect of the three-year short-term engagement, and up to the end of 1952 about 57,500 had joined the R.A.F.

The numbers of men and boys recruited on regular engagements to the Royal Air Force was estimated at 39,000 for 1953, compared with an actual enlistment in 1952 of 39,800.

Regular male strength of the Royal Air Force as at April 1st was 139,400 in 1951 and 171,500 in 1952 (both actual) while the estimates were 189,300 for 1953 and 198,000 for 1954.

Total active strength, including National Servicemen, and women, showed that the strength of the R.A.F. would decline by about 3,500 during 1953-54. The reduction arose mainly from the smaller training organization required to support the reduced rate of front-line expansion now contemplated.

There had been a small but steady improvement in the numbers of volunteers in the Air Force Reserve forces, but progress had been slow in respect of National Service reservists.

National Service Plans

Reference is then made to the future of National Service. It is stated that the Government are satisfied that, having regard to the present international situation, it would be impossible to allow a depletion of the armed forces and their reserves to the extent that would occur if the power to call men up for National Service on reaching the age of 18 were to be allowed to lapse at the end of 1953. The position is to be kept under review in the light of developing circumstances, but the power to call up must be retained beyond the end of 1953, on the understanding that it will be exercised in such a way as to restrict the burden to the minimum that safety demands.

The Government also consider that the present period of 24 months' whole-time service must continue; and, while the possibility of shortening this period will be reviewed from time to time, it is proposed that the present National Service scheme should be extended for a further five years.

It is proposed that N.S. men called up for whole-time service during the five-year period beginning January 1st, 1949, and ending December 1953, should, after completing their terms of whole-time and part-time service under the 1948 Act, remain registered for a further period of five years as liable to recall in a military emergency. It is not intended to call them up for part-time or annual training during this period.

The annual call-up for training of Class Z (Army) and G (R.A.F.) reservists is to be discontinued, and their liability to recall in a military emergency will cease when they have reached their 45th birthday.

An important reference is then made to production. It is recalled that the Prime Minister said last December that, if the three-year rearmament programme had been carried through in full, expenditure on production in 1953-54 would have been over £850 million. The effect of the decisions which have now been taken will be that such expenditure in 1953-54 will be about £650 million.

So far as possible the curtailment of earlier production plans will be brought about by spreading deliveries of equipment over a longer period, but this will be so designed as to impose the longest delays where the need of the Services is less urgent, or where production could be rapidly increased in emergency.

The application of super-priority to certain vital types of equipment has been of great benefit, it is stated, in ensuring the prompt and adequate supply of materials and semi-fabricated parts, and this system has recently been extended to cover two new types of medium bomber, as well as certain civil aircraft.

* "*Statement on Defence*" Cmd. 8768. *Price* 9*d. H.M. Stationery Office.*

Manufacture of war material for export is here mentioned, and also the fact that up to February 1st 1953 the United States had placed off-shore orders in this country for equipment and supplies for their own forces and for transfer to other NATO countries to the value of 167 million dollars. Discussions are continuing with the U.S. authorities about the placing of further orders of this sort in the U.K.

Dealing with labour, the White Paper states that in the aircraft industry the labour force has expanded in 1952 as expected; the numbers have grown from 177,000 to 206,000 and more workers will be required for super-priority aircraft as production expands. In all, the total labour force engaged on production for the Services and on research and development in 1953 will be about 850,000.

Delivery of machine tools has continued to be satisfactory, and there has been a marked improvement in supplies of raw materials.

Under the title "Main Features of the 1953-54 Production Programme," it is stated that the emphasis in the Naval New Construction programme, as in 1952-53, will be on the building of ships for minesweeping and anti-submarine duties; on the progress and completion of aircraft carriers; and the provision of some modern aircraft for operation from them and for shore training.

In the R.A.F., aircraft continue to represent by far the largest item, accounting for a little over half of the total production programme. The aircraft programme carries out the recently announced aim of concentrating effort upon more modern and advanced machines and curtailing the production of some of the current types. Aircraft gun ammunition and bombs are the main items in the explosives programme in 1953-54, and under the radio and radar programme the expansion and modernization of the radar network in the United Kingdom and overseas will continue, and mobile signals facilities will be provided. The delivery of F.86 Sabre aircraft to the R.A.F. will continue throughout the year.

Increased costs are given as the main reason for the rise in Ministry of Supply expenditure on the defence account. Expenditure on research and development in 1953-54 will be well over £100 million—about 40 per cent more than in 1951-52. The more expensive elements in the programme are guided weapons, airframes and engines, and electronics, but the cost of atomic energy research is not included in the defence budget.

A brief reference is then made to development work, and the names of Vulcan, Victor, Javelin, Swift, and Hunter aircraft are mentioned, as also is the Rolls-Royce Conway by-pass engine.

Works services are estimated to cost £171 million next year, compared with a provision of £168 million in 1952-53, the main features of the programme continuing to be the provision of new airfields and the modernization of existing ones; covered storage; the air defence system; and work at research and development establishments. The programme of works services undertaken by the Air Ministry on behalf of the U.S.A.F. in this country will increase during 1953, and the United States Government will continue to make a substantial financial contribution.

FROM ALL QUARTERS

Jets for Egypt

IN the Commons on February 16th, Opposition members attempted to secure the adjournment of the House over the question of the supply of jet aircraft to Egypt and other countries of the Middle East. The attempt failed by 267 votes to 238.

Mr. Dalton (Lab., Bishop Auckland) opened the debate by saying that the collective defence of the Middle East could have no real meaning while tension between Israel and the Arab states continued. Supply of arms was likely to increase that tension rather than diminish it. Britain was committed, by the three-power declaration of May 1950 with the United States and France, to protect the frontiers between Israel and her neighbours against violation or aggression from either side. This meant we had a particular interest in maintaining a low level of armaments in all the states affected.

There was much dangerous talk in the Arab states of a "second round" with Israel, to reverse the military results of the war of 1949. Jet aircraft might be used not only against Israel but against forces of Britain, America and France entering to prevent aggression.

He understood that an offer had been made that jet aircraft would be supplied in equal quantity to Israel and each of the Arab states. This would not only promote an arms race but would put the balance of power heavily against Israel.

Mr. Selwyn Lloyd, Minister of State, said it was not the practice to reveal details in the House with regard to these matters, but the number involved was extremely small.

When the deliveries now contemplated were added to those already sent, the total for all the Arab states would still be less than the number supplied to Egypt by the Socialist Government in 1950. Israel had also concluded a contract to purchase some. To accede to Mr. Dalton's request would mean that Israel would have no jet aircraft at all. Another result would be a repudiation of our treaty obligations to Iraq and Jordan.

These aircraft were not required for our own use, nor were they wanted for sale to any NATO country. They were a worthwhile export because it was important that we should get into these markets. The sales would also help to maintain productive capacity and retain skilled labour adequate for meeting an emergency. On these three economic grounds there was an overwhelming case for continuing these sales.

As to the possibility of the weapons being used against our own troops, the Government did not believe that this was likely to happen, and he was advised that there was no threat at all. Nor did the Government believe that the aircraft would be used by the recipients for aggressive purposes against one another.

If we failed to supply them, someone else would certainly do so, and it might be someone without our knowledge of the strains and stresses of the Middle East, and less able to balance the factors.

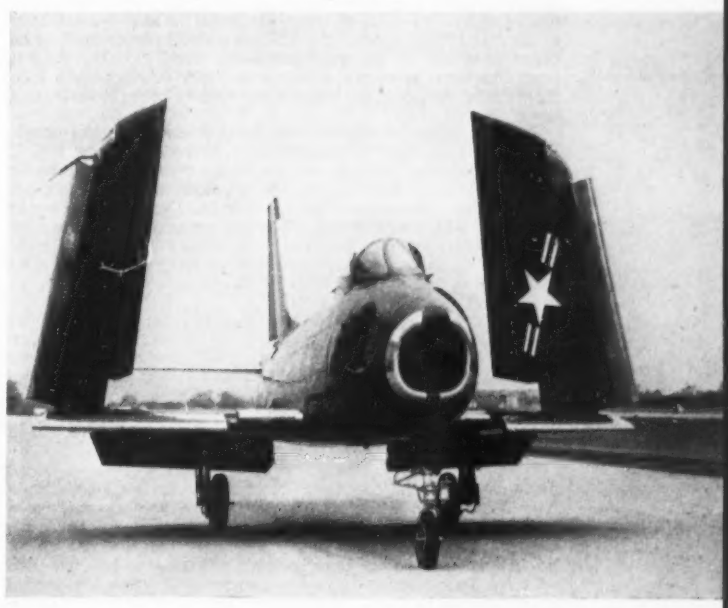
A long—and often discursive—debate followed Mr. Lloyd's remarks. A. Cdre. Harvey (Con., Macclesfield) said that some of the equipment being sent to the Middle East was more modern than that of some of our own squadrons. Mr. Wigg (Lab., Dudley) claimed that he could reveal the numbers which the Minister had refused to divulge: 14 jets had been supplied to Egypt and 14 to Syria, and he understood that negotiations had begun for the same number for Israel. Maj. Legge Bourke (Con., Isle of Ely), remarked that if Russia was considered a menace in the Middle East, then the sure way of making certain that she would take advantage of it was for us to denude those countries of arms.

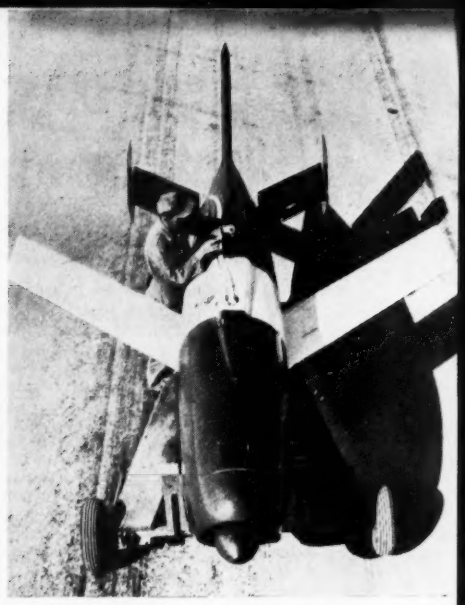
Replying to the debate for the Government, Mr. Nutting, Foreign Under-Secretary, said that the total number of jet aircraft delivered in the last few months was less than a score.

The state of war between Israel and her neighbours was purely technical. The countries to which we had authorized the sale of jets had given us the assurance required by the tripartite declaration.

"If the Opposition divide against the Government on this

FOLDED SWEEP: The North American FJ-2 Fury, probably the best carrier fighter available anywhere, is now in full production at Columbus, Ohio. Armed with four 20 mm cannon, it corresponds to the F-86E Sabre. The Royal Navy—the aircraft equipment of which was discussed in a production debate in the House of Lords last week, as reported on page 252—has no swept-wing fighters.





SAVAGE AND FIREBEE: Taking off on its first flight from Port Columbus, Ohio, is the first North American AJ-2 Savage to be built there. Largest carrier-based bomber at present in service, the Savage can carry an atomic bomb. On the right a U.S.A.F. sergeant is seen preparing a Ryan Q-2 Firebee for launching by a B-26 Invader operating from Holloman A.F.B., New Mexico. The Firebee is a "near-supersonic" pilotless target powered by a Fairchild J.44 turbojet; return to earth is facilitated by a two-stage parachute.

FROM ALL QUARTERS . . .

issue," said Mr. Nutting, "they are, in fact, repudiating the declarations into which they entered. We do not think that these sales will increase the tension in the Middle East."

Israel would suffer if these supplies were stopped, as the Arab countries had received planes from the Socialist Government. The Israel Government had asked this country for jets before the Government took the decision last August to release aircraft to the Middle East states.

To suggest that by allowing the Arab states to have these aircraft we were imposing a burden on Israel was a completely false point.

Another Masefield Occasion

IN spite of his manifold executive responsibilities, Mr. Peter Masefield always contrives to find time to propound the air-faring outlook, vigorously and frequently. It was no surprise, therefore, to hear him speaking on air-transport affairs before the Aircraft Recognition Society on February 18th, only nine days after his lecture to the Institute of Transport: indeed, his address is an annual event for the Society, of which Mr. Masefield is president.

The mainly youthful audience filled the Royal Aeronautical Society's library to hear Mr. Masefield's talk and to view his collection of slides. "I shall be quite interested to hear what I have to say about these slides," the lecturer himself commented, as he began to review air transport progress to date. During the last twelve months, aviation's almost mandatory craziness had been clearly demonstrated, for had not the airlines brought their fares down, instead of up?

Demonstrating the ever-moving developments in airline operation, Mr. Masefield showed pictures of contemporary B.E.A. machines, bearing in mind that particular evening's audience by pointing out here and there an added window, to assist in accurate identification. Experience gained with the Dart Dakotas would minimize any introductory difficulties with the Viscount; for example, there was now no fear of large blocks of ice "putting the fire out"; instead, the use of de-icing pads had given the prospect of increased power from the water-injection effect of the now-melted ice.

Other aircraft types, and their economics, were then exhaustively discussed by the lecturer, together with the trend of air fares. Some interesting information on B.E.A.'s present and future fleets preceded an estimate of the potential sales value of British civil aircraft up to 1958, and the appearance of helicopters on the air transport scene was commented on.

A useful discussion followed, in which Mr. Masefield was asked questions on the advisability of airlines racing at high speed to New Zealand, the possible need for a Rapide replacement, the possibility of speeding-up Customs formalities, the disadvantages of cabotage regulations, and the future of the London-Paris services. His answers, in brief, were that B.E.A.'s race entry could do a lot of good, and was not dangerous; there certainly *was* the need for a Rapide replacement; the Customs at Northolt had been "educated" and did not waste time; cabotage worked both ways; and competition on the London-Paris route should prove—well, interesting.

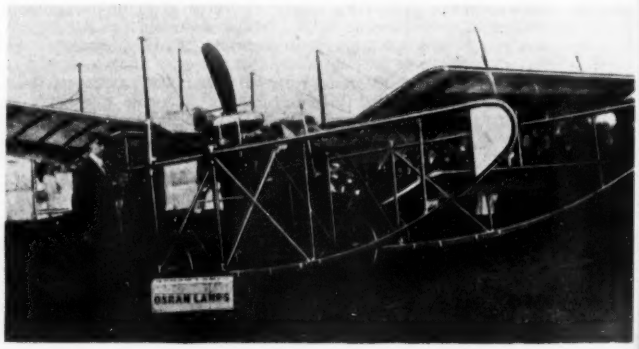
After his talk, Mr. Masefield presented a number of the Society's awards to various members.

New Construction Methods

BEFORE the Royal Aeronautical Society last night (February 26th), Mr. H. J. Pollard, Wh.Ex., F.R.Ae.S., divisional director (aircraft) of the Bristol Aeroplane Co., Ltd., was due to present a paper entitled *New Materials and Methods for Aircraft Construction.*

The intention of the paper was to indicate the potentialities of new materials for primary structure and other aircraft applications. Although basic structural design had varied considerably during the past few years, all construction still related chiefly to the use of aluminium. The lecturer believed that the time had come when its use might be challenged for certain ranges of aircraft structure, and that certain materials would come into use for primary structure as first did wood, then steel and then aluminium alloy. The older materials would continue to be used in the foreseeable future, particularly aluminium alloy, but the use of certain of the new materials, notably asbestos- and glass-reinforced plastics, in certain types of aircraft, should result in more efficiency and decidedly cheaper structure and other components.

That the weight and cost saving possibilities of the "new" materials had not been fully realized hitherto was probably due to the fact that, for most projects, aluminium alloy had proved immediately adequate both from a technical and production standpoint. Concerning the new materials, the paper described in turn asbestos fibres, asbestos plastic moulding, glass-fibre



BRITANNIA TROPHY FLASHBACK: Last Wednesday evening the Royal Aero Club was due to hold its Britannia Trophy Dinner, when plaques were to be presented to surviving winners of the Trophy. The award was originally presented by Horatio Barber, seen here with one of his two Valkyrie monoplanes. The photograph was taken on July 4th, 1911, when Mr. Barber carried the first commercial air cargo—a consignment of Osram lamps for G.E.C. He flew them from Shoreham to Hove Lawns, and he devoted the payment he received to the purchase of the Trophy.

plastic, cellulose fibre plastic, resins and foamed resins, and then dealt with construction by means of aluminium alloys, magnesium alloys and titanium. After surveying progress to date, the lecturer forecast that, in the near future, it would be possible to build economic aircraft—"probably flying-boats"—of three or four times the present size.

Co-ordinating Australian Production

A FOUR-MAN mission to discuss co-ordination of effort between the United Kingdom and Australia in the production and development of aircraft and equipment left London Airport last Monday for Melbourne.

The mission consists of three senior officers of the Ministry of Supply and one representing the Air Ministry. It is led by Mr. W. C. Puckey, Deputy Controller of Supplies (Air), and his M.o.S. colleagues are Rear Admiral G. F. Burghard, Deputy Controller, Electronics, and Mr. A. E. Woodward-Nutt, Principal Director of Research and Development (Aircraft), who was appointed to that post when the aircraft side of the Ministry was reorganized last September. The Air Ministry's representative is A. Cdre. W. H. Kyle, Director of Operational Requirements (A).

Discussions will take place with Australian Government departments, and the mission will visit research establishments and the major firms engaged in aircraft, engine and component production.

Air-Racing Send-off

AIR racing received an unofficial new-season send-off last Monday evening, when the Throttle Benders entertained colleagues and friends at Ciro's Club in London. Naturally, handicappers, marshals, fuel experts and so on were present among the fifty who dined and danced, and in addition there were many well-known pilots (and their wives), including Neville Duke, Pat Fillingham—British Air Racing Champion last year—Tom Hayhow and Hugh Kendall.

Mrs. Preston, wife of Colonel R. L. Preston, cut a hug ecake appropriately decorated with pylons and a much mishandled throttle. Organizing hosts were Mr. and Mrs. Nat Somers and Mr. and Mrs. Walter Bowles—assisted, we have no doubt, by Ron Paine, Fred Dunkerley and Jimmy Rush.

Picking up the Bits

CONSIDERABLE interest was occasioned at London Airport last Monday by a demonstration of an unusual vehicle—a magnetic sweeper. Designed by the General Electric Company for towing behind any convenient vehicle, it is operated under remote control and can handle up to four hours' continuous working at from 5 to 10 m.p.h. without re-charging of the batteries. The sweeping-width is 6ft, and 4ft and 8ft versions are also in mind. The height of the magnet above ground can be varied, but a 3in gap is recommended for normal use.

M.C.A. and airline officials were particularly interested in the use of the sweep for dispersals and maintenance areas and for final clearing-up on the scene of an accident, although the amount of scrap metal and nails to be picked up on ordinary runways and taxi tracks is remarkable—and not a little alarming to a pilot or operator.

The patented design of the machine, two of which have been constructed to date, is the work of Mr. Richard D. Amies of G.E.C. The total weight of the machine is 19 cwt, of which total the batteries represent 6 cwt. The magnet requires 90 volts D.C. and takes 17 amp. A price of £620 has been fixed provisionally.

Lockheed C-130 Transport

ONE of the most interesting American designs to be revealed since the war, the four-engined high-wing Lockheed C-130 military transport is intended to combine relatively high performance in the air with small-field operating qualities. With such characteristics in mind it is to be powered with an improved version of the Allison T-38 turboprop (three-blade Curtiss-Wright Turbolectric airscrews), and equipped with special tandem-wheel tricycle landing gear and large-area, high-lift flaps.

In size the C-130 is in the 110,000-lb class, with span, length and height respectively 132ft, 95ft and 38ft. Unofficial figures of 25,000 lb load for 2,500 miles have been mentioned. The four T-38s will together give about 15,000 e.h.p.

The squat fuselage is only 45in from the ground, but the tail is sharply upswept to accommodate a built-in loading ramp which itself serves as the rear door. In addition, the aircraft has a large forward cargo door to permit simultaneous front and rear loading. The rear door can be opened in flight to permit the dropping of troops or equipment. For front-line ground support the duties of the machine over comparatively long ranges might include flying-in large items of equipment—tractors and 155 mm howitzers are instanced by the makers. Provision is also made for fitting-out as a hospital aeroplane.

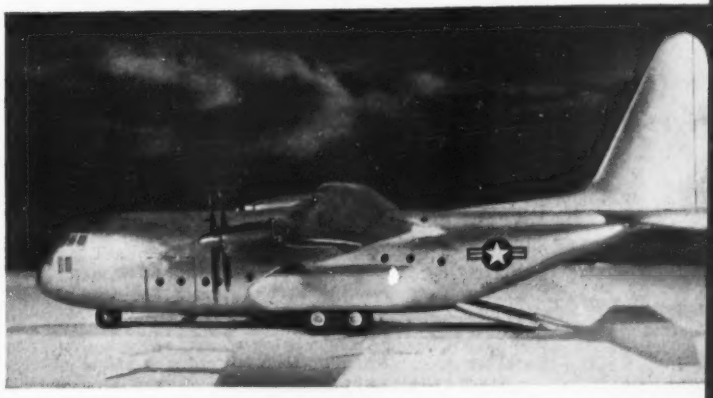
The C-130 may be described as a joint design by Lockheed and the U.S. Air Force, but it is quite likely also to prove of interest to civil operators. At the Lockheed factory in Burbank prototypes are under construction, and in addition a production contract has been placed for execution in Lockheed's Marietta, Georgia, factory.

BOLSTERING THE WEST: Capitaine Jacques Wolff of the French Air Force is here seen in the cockpit of his F-84G Thunderjet, which 1st Lt. R. G. Hall, U.S.A.F. (left), has delivered to its new base at Rheims. During February, some 50 Thunderjets have been flown from the United States, under the M.D.A.P., to join French units.

Against the Budworm

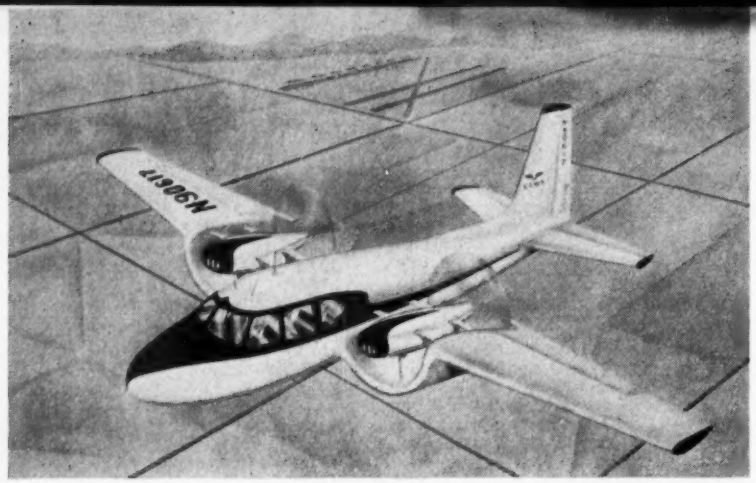
A SERIOUS situation has been developing for some time past in New Brunswick, Canada, where it is estimated that 5,000 square miles of balsam fir and spruce forest, used for manufacturing paper and many other products, are already infected by the budworm. Last year, in "Operation Budworm," 300 square miles were experimentally sprayed with D.D.T. insecticide, and highly successful results were achieved. Now it is planned to spray a further 1,500 square miles. Seventy-five aircraft will be required, of which only about 20 are available in Canada: the remainder are to be obtained from the United States. It is stated that highly manœuvrable biplanes with good performance will be employed, as demanded by the hilly nature of the terrain (oddly, no mention is made of helicopters). Wheeler Airlines, of Ste. Jovite, Quebec, have been given the contract for the job by Forest Protection, Ltd., a non-profit-making corporation formed by the Provincial Government and four pulp and paper companies.

A million gallons of insecticide will need to be transported to five new airfields, and half of this has already been delivered. Spraying will take place in late May or early June, when the liquid will have its maximum effect against the budworm. Cost is likely to run into several million dollars, as a further 1,500-square-mile operation is planned for next year.



THE LOCKHEED C-130, in model form, referred to above. Note the tandem-main-wheel tricycle landing gear. There appear to be two engines with contra-props; actually there are four separate units.

HERE AND THERE



DARK HORSE? Easily the most unconventional entry for the England-N.Z. Race is the Custer CCW-5 Executive, of which this is an artist's impression. It is said to be "almost completed"—though whether this implies that it will be ready to race half way round the world by next October is, perhaps, another matter. The Custer "channel wing" is claimed to give vertical lift and the ability to hover. Race prospects are discussed on page 249 of this issue.

Five-Star Harvard

HAVING completed his *ab initio* training in a Chipmunk, H.R.H. the Duke of Edinburgh is now flying a Harvard with his instructor, F/L. C. R. Gordon. The aircraft carries the five-star insignia denoting a Marshal of the Royal Air Force. On Monday the Duke went solo.

Helicopter Crews Thanked

CREWS of 18 helicopters which assisted in the flooded areas of Holland were received by Queen Juliana and Prince Bernhard on February 17th. The machines —one Dutch, one Belgian, five British and 11 American—landed in the grounds of the Soestdijk Palace.

Canada's Expanding Industry

SPEAKING in Quebec last week, Mr. Campney, Canada's Associate Defence Minister, said that the aviation industry was fast becoming one of the greatest in the Dominion; almost half the air defence appropriation—$420m—was for aircraft and engines, and a new industry was arising to meet the demand. Mr. Campney said that Canada had produced more than half the 400 F-86 Sabres promised to NATO members, and that this year another six squadrons of R.C.A.F. Sabres would go to join the six already serving overseas.

"Corporate" DC-6Bs

RECENTLY it was announced that over 10,000 aircraft are operated by American business houses to facilitate the transport of their employees and equipment. Two of the largest are now owned by the Arabian-American Oil Company, for they have taken delivery of two Douglas DC-6Bs for transatlantic work. The aircraft are specially equipped with a combination of seats, divans and sleeping berths; there is also plenty of space for coat racks and four washrooms. Aramco will use them on an eight-times-monthly schedule between New York and Dharhan, Saudi Arabia. The Aramco fleet already includes DC-3s and DC-4s, and a staff of 80 are engaged in its operation. Over 3,000 Aramco employees and their families cross the Atlantic annually.

AUSTER CIRRUS AUTOCARS supplied to the Food and Agriculture Organization of the United Nations carry these attractively designed insignia on the port engine cowling.

"FLIGHT" NEXT WEEK

OUR issue dated March 6th will be the annual Commercial Aviation Number. Considerably enlarged, it will include features of value to all engaged or interested in the subject. Contents will include the specially contributed views of commercial-aircraft constructors of five nations, reviews of aircraft and equipment, and a guide to the world's airlines.

For Yachtsmen

THOSE of our readers who are also sailing enthusiasts are reminded that the March issue of *Yachting World*—on sale today—is the annual "fitting-out" number, containing much practical information.

Cranfield Society Reunion

DETAILS of the Cranfield Society reunion on Saturday, March 14th have now been announced. The dinner begins at 7.30 p.m. in Mitchell Hall, and will be followed at 9 p.m. by the annual general meeting. A Rugby match between past and present students is to take place on the College ground at 3 p.m., after which an informal joint meeting with present students will take place in Lanchester Hall. Further information is obtainable from Mr. J. Lynall (hon. secretary) at the College.

South African Titanium

IT is reported that large deposits of titanium ore have been found on the south coast of Natal. A South African mining company is prospecting in a large area around Umgababa, near Umkomaas, and mining is to begin this year. An experimental plant has alreay been installed and samples of the first output have been sent to the U.S.A. for test. It is claimed that more than a million tons of ilmenite ore exists in the district, containing an average of 50 per cent titanium oxide. A statement accompanying this news is worthy of quotation—"Titanium is of value to jet aircraft as it is claimed to be the only metal that does not melt at supersonic speeds."

W.J.A.C. Air Display

ON Whit Monday, May 25th, the Women's Junior Air Corps is to hold a Coronation Flying Display at White Waltham, with accommodation for 10,000 spectators. It is hoped to have Service flying support.

Course on Corrosion

A SPECIAL course of six evening lectures on "Corrosion Testing" is to be given in the Department of Applied Chemistry at Northampton Polytechnic, St. John Street, London, E.C.1. The lectures begin on Wednesday, March 18th, but will thereafter be given on Tuesday evenings.

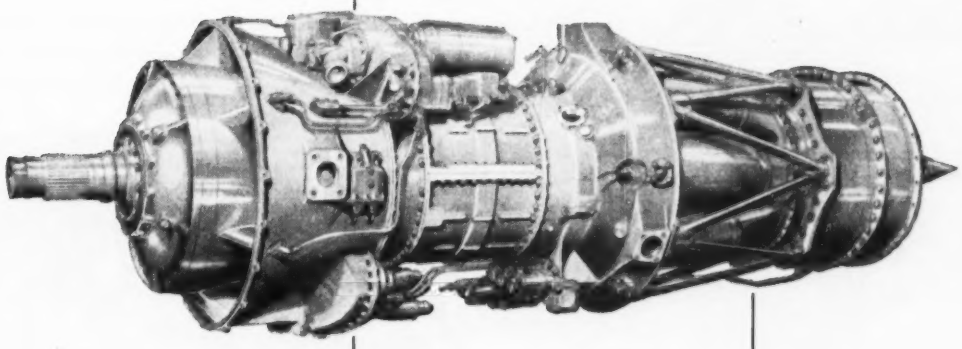
Four in Hand?

ACCORDING to the military correspondent of the *Daily Herald*, Britain has four atomic weapons, all developed since the Monte Bello tests. They are: warheads for 3,000 m.p.h. guided rockets; torpedoes for launching by submarine, surface vessel or aircraft; artillery shells; and bombs guided by the aircraft that launch them.

Inside Story

DAVID MORGAN, Supermarine test pilot, visited the College of Aeronautical and Automobile Engineering, Chelsea, on February 17th and talked to students on experimental flight-testing. Mr. Morgan was recently awarded the Geoffrey de Havilland Trophy in recognition of his flight from London to Brussels in a Supermarine Swift at 665.9 m.p.h.

"One final question: see if you can find the windscreen."



ELAND

A 3000 c.h.p. single-shaft gas turbine for single-rotation propellers developed to give exceptionally low fuel consumption — for example 0.49 lb/bhp/hr at 350 m.p.h. and 30,000 ft.

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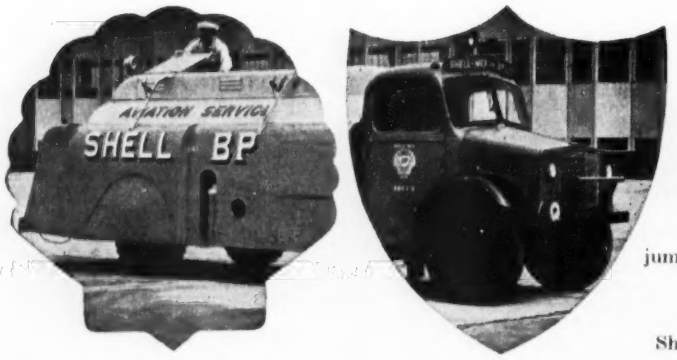
The aeroplane

The Westland Wyvern Mk. IV. A very new naval strike fighter (fuelled and lubricated by Shell-Mex and B.P. Ltd. during its development), still mainly on the secret list. A typical Westland machine, with the characteristic fin and unusual tail-plane. The Rotol eight-bladed contra-rotating propeller is driven by an Armstrong-Siddeley Python turbo-prop engine. Span: 44′, length 42′ 3″.

the pilot

Harald Penrose joined Westland Aircraft 27 years ago, and became a test pilot two years later. Before the war his "crazy flying" with the Westland Widgeon was one of the funniest events at many air displays. He is a pioneer of high-altitude flight, and earned a wartime O.B.E. after his stratospheric researches with the Westland Welkin. Says that "Shell and BP Aviation Service 'gets' you anywhere".

SHELL and BP Aviation Service



Take a look round any number of manufacturers' airfields. The chances are you'll see Shell and BP Aviation Service in operation; right on the spot for the newest machines on their first test flights. There's the same friendly, efficient service at all the major airfields in Britain, where the enthusiastic crews of Shell and BP Aircraft Servicing Vehicles are all ready to jump to it smartly and cater for *your* refuelling needs.

SHELL AND BP AVIATION SERVICE,
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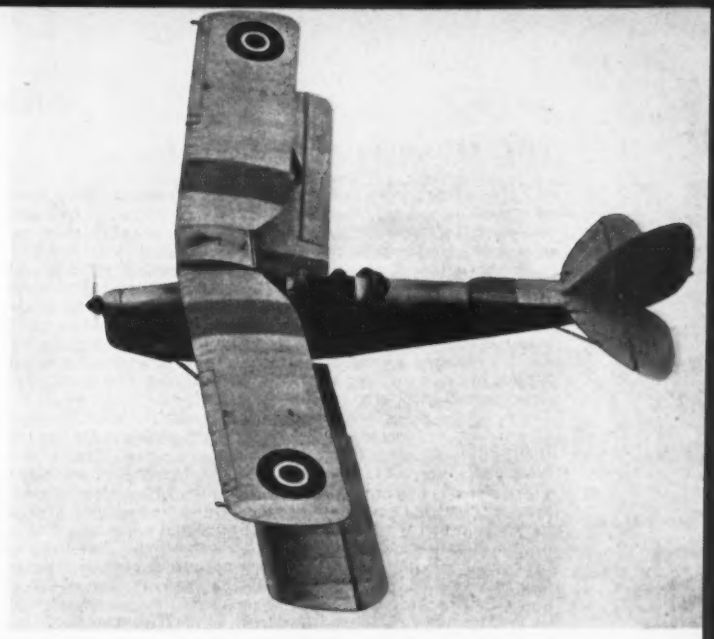
THE TIGER COMES of AGE

A Birthday Tribute

By C. NEPEAN BISHOP



THE de Havilland Tiger Moth first gained its C. of A. early in March, 1932, and next Saturday week, March 7th, the Vintage Aeroplane Club is holding a Tiger Moth Rally at Denham. In this article C. Nepean Bishop—well known as an aerobatic and racing exponent of the type—tells something of the Tiger's life-story in civil and Service roles. He expresses his indebtedness, for much factual assistance, to Messrs. A. J. Jackson and M. J. F. Bowyer of Air Britain. Incidentally, the "axing" of civil-operated schools now leaves the training-equipment situation fluid.

BY the time these words appear in print it may well be that the de Havilland Tiger Moth will have made its last flight in Royal Air Force colours, just 21 years after the type first appeared. Some two or three years ago it was announced that a successor from the same stable, the Chipmunk, was to replace the Tiger in the Reserve Flying Schools of the Royal Air Force and, after an initial delay, the change-over began.

Whilst it must be said that all who fly the Chipmunk are loud in praise of this aeroplane it cannot be denied that there are very many who will be very sorry indeed to see the departure of the Tiger, an aircraft which had probably been flown by more pilots than has any other type—not excluding the famous old 504k Avro; so an account of some of the parts the Tiger has played in British aviation during the past two decades will now not be amiss.

In point of fact the name "Tiger Moth" did not originate with the little biplane we know today, the first aircraft to bear the title being the tiny racing monoplane G-EBQU which was produced by de Havilland's in 1927. This, the D.H.71, together with its brother G-EBRV, was used as a flying test-bed for the original Gipsy I engines, and in the late twenties 'QU created several light aeroplane speed records. Incidentally, 'RV survived until the late war, when it was destroyed by enemy action.

Early in 1931 the de Havilland company produced a training version of their already famous Moth; designated the D.H.60T. It was a variant of the normal metal-fuselage Moth, and with instrumentation brought up to Service standards; the first example was registered G-ABKM. Later in the year a D.H.60T Tiger Moth, registered G-ABNG, was produced; and it was the first machine to have the shape that is today so familiar. (It set another fashion, also very prevalent today, inasmuch as it was sold to Sweden not so very long after being registered in England!) Later still, in September 1931, another aircraft, G-ABRC, appeared on the civil register, this being classed as a D.H.82 Tiger Moth. It received its Certificate of Airworthiness in March 1932, thus beginning the series of aircraft that was to be in production for the better part of a decade. At first the type was fitted with a Gipsy III engine of 120 h.p., but later the 130 h.p. Gipsy Major became standard.

The first batch of civil Tiger Moths (apart from a few "one-offs") were registered G-ACBA to G-ACBG, and in black and orange livery, were used at the Filton Reserve School from 1933 onwards. At about the same time the second batch, registered G-ACDA to G-ACDK, were put into service by the de Havilland school at Hatfield, the colour scheme in this case being maroon and silver. *En passant*, it is interesting to note that one of this batch, G-ACDI, was still flying at Hamble in 1950, having served during the war as BB742 in the Royal Air Force and flying over 6,000 hours in her seventeen years of existence; and G-ACDG was still flying last year in Holland as PH-UAY.

The Service then began to take an interest in the type, a batch numbered from K2567 to K2601 being delivered to the Royal Air Force; after some had been tried out by the Central Flying School they were distributed around various units. Thereafter the majority of Elementary and Reserve Flying Training Schools were equipped with the Tiger as and when they were formed, until, at the outbreak of war, No. 56 was in process of being started.

Some of these Tigers had Service numerals and colouring, but those operated by civil companies were—at first, at any rate—given civil registrations and were finished in the various colour-schemes used in those days.

In the meantime the more wealthy civil flying clubs had not been slow in re-equipping with the D.H.82—notably Brooklands, which replaced all its Gipsy Moths with the Tiger, and the Cinque Ports Flying Club at Lympne, which did likewise.

So it will be seen that at the outbreak of the war the Tiger Moth was already very well established as a trainer. In addition, it had become the first full-scale aeroplane to be completely controlled by radio: in this guise it was the Queen Bee, over one hundred of which were built. As the primary use of the Queen Bee was that

"Flight" photograph

The D.H. 60T of 1931, a trainer version of the Moth, was the stepping-stone to the Tiger Moth.

THE TIGER COMES OF AGE . . .

of an aerial target for A.A. gunnery this seemed rather a waste of a good aeroplane, but presumably it was necessary, and later models at least were not true Tigers inasmuch as the fuselage was of wooden construction instead of the standard metal type.

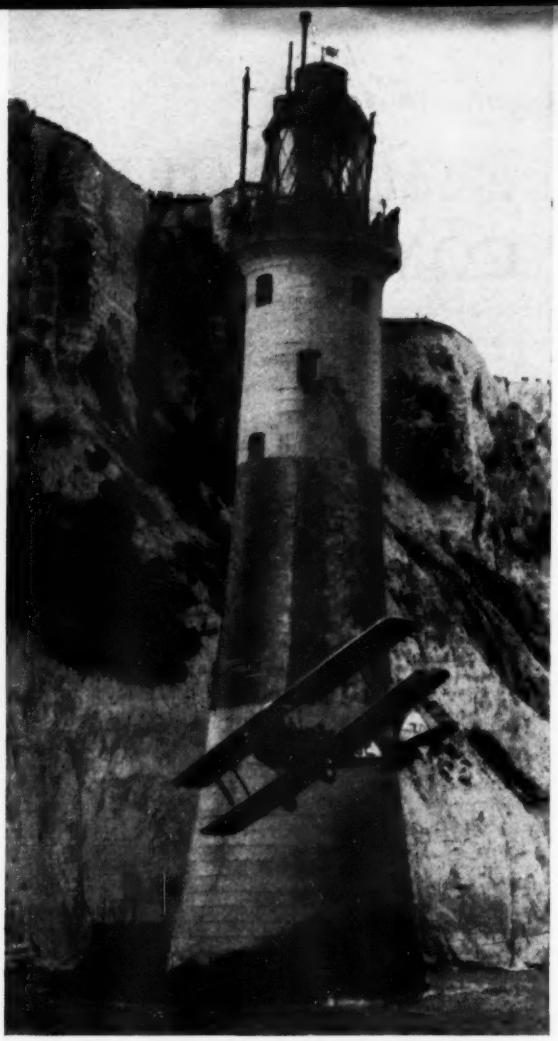
At the outbreak of war the Elementary and Reserve Flying Training Schools run by civil companies—how valuable, in official eyes, they *then* were—had to repaint their aircraft in the standard colouring and, of course, roundels, of Reserve Command (which had been formed for V.R. training early in 1939) and in due course they appeared looking like any other Service Tiger Moths, but still carrying their civil registrations. Later still they were given Service numerals, mainly in the "BB" series. All the Tigers of the flying clubs were not immediately taken over; in March 1940 the Brooklands fleet were still standing in the hangars at Sywell, resplendent if somewhat dusty in their old livery of red, black and silver. One of them, G-AESD, finished up at Halton, where she was presumably used to teach the young idea the rudiments of rigging, so possibly the other non-slotted aircraft (as were most of those of the Brooklands Club) suffered a like fate.

I have mentioned earlier that the Tigers of the civil-operated Service schools appeared in the Reserve Command colour-scheme; this consisted of camouflage on all top surfaces; yellow on all undersurfaces and, at first, yellow up to the top longerons, with camouflage applied above. Suddenly other Tiger Moths began to appear. These were camouflaged all over their top surfaces and fuselage, whilst below was the duck-egg blue of Coastal Command. I have seen very little mention of these Tigers, but at the beginning of the war they had a most exacting duty to perform, that of flying out over the English Channel, North Sea, and elsewhere on submarine patrol duties. These duties entailed flying for long periods at only a few feet above the waves and out of sight of land; never, I imagine, had so many pilots been so glad of the reputation of the Gipsy Major engine! A little later still some Tiger Moths appeared carrying 20lb-bomb racks beneath their fuselages. This was at the time of the Battle of Britain and the general idea was that if there *was* an invasion every available aircraft would harass the enemy as long as it could remain airborne—which in some cases would not have been for very long!

As the war progressed the Tiger gradually gained more ground, for about 1942 even the E.F.T.S. units which were equipped with the trusty Magister began to be re-equipped with the biplane. Besides being turned out by de Havillands themselves, Tigers were also manufactured by Morris Motors, these being mainly identified by their "T" series serial numbers. Previous aircraft had been in the "K," "L" and "N" series before the war, and "R" in the early part of hostilities.

Not only in the British Isles did the Tiger flourish; over the Empire it was playing its part in the Empire Air Training Scheme. In Southern Rhodesia alone there were four Elementary Flying Training Schools equipped initially with Tigers, although later they were re-equipped (under Lease-Lend) with the Fairchild Cornell. In 1941 nearly all the aircraft were of the "T" series, and very good service they gave too. Later, replacements came from Australia and were numbered firstly without a prefix at all, and subsequently in the "DX" series.

The airfields in Rhodesia were 5,000 feet a.m.s.l. with the result that performance suffered somewhat and, in addition, the soil was extremely dusty, so that engines had to be overhauled at more frequent intervals than would normally be the case. Also, the



The nimble Tiger has often distinguished itself in air racing. This striking picture (the pilot was Beverley Snook) was taken at Beachy Head during the 1952 "Daily Express" Race.

weather each day varied from cool mornings and evenings to burning heat in the mid-day hours and there were the tropical rain and thunderstorms to be coped with as well. But from 1940 until 1944 the Tiger carried on in Rhodesia and there were no complaints on the score of bad serviceability. True, we had our moments, one being when I was asked to air-test T8235 after she had been "snagged" for bad climbing. A different airscrew had been fitted and as I took off she seemed to gather speed very slowly indeed. However, she left the ground, and on reaching the normal 60 m.p.h. I eased the control column back to put T8235 into a climb; but, instead, all that happened was that she stayed where she was—some five feet off the ground—and the speed dropped to 50 m.p.h. That was one of the shortest flights I ever made!

Another Rhodesia Tiger that comes to mind was CR-AAG of the Aero Club de Beira. She had been in collision with a hill in Portuguese East Africa and arrangements were made to have her repaired in Southern Rhodesia, this being the nearest place where D.H. spares could be obtained. When the remains arrived, literally in sacks, everybody stood round and gaped. However, "Maintenance" were not to be beaten, and duly got to work. A few days previously some dumb pupil had well and truly bent DX544 (an Australian-built Tiger Moth), but the rear half of the fuselage and tailplane were serviceable. To this was added side-frames from stores, together with a new set of mainplanes and undercarriage; the engine was rebuilt, and in due course CR-AAG reappeared, resplendent in the maroon and silver colours of the club. I had the pleasure of giving her the acceptance test flight—and what a Tiger she was! I only wish I could have confronted the Royal Aero Club handicappers with her in the King's Cup after the war, for she was fully 20 m.p.h. faster than normal; and nobody knew why! Without difficulty I carried out *two* slow rolls

"Flight" photograph

Tiger Moths have performed a great variety of civil duties, including crop-dusting. This demonstration was given at Panshanger in 1950.

without stopping to build up speed between them. When "Com-Squad" delivered the aircraft back to Beira they likewise commented on her remarkable speed.

When the Fairchild Cornell replaced the Tiger Moth in Rhodesia,* a number of the more elderly Tigers were "reduced to produce"; but those which had comparatively few flying hours were transferred to the South African Air Force. At least, that was the idea. With the number of aircraft on the station after the arrival of the Cornells, there was certainly no room for the Tigers in the hangars, with the result that they had to stand outside, with disastrous results to their general condition, especially as regards rigging. As the decision to send them to South Africa was not made at once, they were out some weeks, so when the time came to get them ready for the flight to Induna—a Rhodesian aerodrome near the borders of the Union—it needed considerable work to get them flying "straight and level" once again—especially level. During the first two weeks of February 1944, I made over 60 test flights to get 29 aircraft flying really to my liking! After they had been ferried down to Induna they joined many others which were waiting in the open to be taken on the next stage to the Union, and from all reports were still there some weeks later, so one shudders to think about the state in which they eventually arrived. Incidentally, the machine I took down to Induna myself was T7941, the fuselage of which started life as YP-RAG, a club aircraft of the Northern Rhodesia Flying Club in pre-war days.

When, after the end of the war, permission was given to restart private civil flying in England it was the Tiger Moths of Marshall's Flying School, Cambridge, which were the first aircraft in the air, these including 'AGYU, 'AGVW and 'AGZY. With the initial disbanding of R.A.F. Elementary Flying Training Units, surplus Tigers were put up for sale by the Air Ministry, and during the early part of the new era could be bought for something approaching a song. Many, therefore, found their way into (and in some cases back to) civil flying and are to be found to this day in use in the flying clubs of the Empire both at home and abroad. A number, however, were kept in store for issue to the Reserve Flying Schools when they were reformed round about 1948, and it is these survivors that will shortly be found in the Air Ministry sales lists.

And now the Tiger Moth, in the shape we know it today, comes of age. It looks as if this birthday may be celebrated by an entirely civil Tiger fleet—which is as it should be; and I think that all will join me in expressing the hope that the Tiger Moth will have many more years of useful flying before it ere becomes rare enough to qualify for membership of the Vintage Aeroplane Club!

* *After the war, Rhodesian training was re-started, using Tiger Moths again*—ED.

NEW ZEALAND RACE PROSPECTS

LAST week we gave a condensed list of entrants for the England-New Zealand air race, due to start on October 8th next. Here, the potentialities of the competing aircraft are discussed under the two separate headings of "transport handicap" and "speed."

It will be remembered that the speed upon which the handicap time will be based is being arrived at by the formula $V = \frac{55W}{P}$, where W = all-up weight, and P = payload to be carried throughout the race. Handicap is thus biased in favour of aircraft with good transport efficiency, since one can generally take cost per ton-mile as being roughly dependent upon $\frac{W}{P}$. Nevertheless, some aircraft, particularly the smaller types, will be forced to put down for refuelling with distressing frequency in order to carry sufficient payload to give them a reasonable handicap speed. Attention may now be turned to the competing aircraft; they are listed in order of increasing all-up weight.

Transport Handicap Section :—

Custer CCW-5 Executive (two Continental SO-470-B). Entrant: Custer Channel Wing Corporation (U.S.A.); pilot, Walter J. Davidson. Custer developments have already been described in this journal (January 4th, 1952), and the CCW-5 is shown in the illustration on page 246. The true potentialities of the CCW-5 are unknown, and the type could prove something of a dark horse. It is a converted Baumann Brigadier and is now almost completed. A 1,500 lb payload for a 1,500-mile range appears possible, cruising at 230 m.p.h.; with an all-up weight of 5,400 lb, the handicap speed is no more than 195 m.p.h., which augers well for the Custer's chances.

Lockheed 18-56 *Lodestar* (two Wright Cyclone 1820-G205A). Entrant: Rausch Aviation (U.S.A.); pilot: Vincent Reavely. This old stalwart is a worthy representative of the many similar aircraft owned by American business houses. Carrying a 4,600 lb payload, it should be capable of 1,000-mile stages at 190 m.p.h. Yet, on this basis, the handicap speed works out at 220 m.p.h.

Douglas DC-3 (engines unstated). Entrant: Mrs. G. T. McKenzie (Australia); pilot: Capt. J. R. Kemp. It is appropriate to recall that a K.L.M. DC-3 finished second in the 1934 MacRobertson race to Melbourne, but the opposition is much more severe this time. With a 6,000 lb payload, 1,100 miles at 180 m.p.h. appears possible, although the handicap speed works out at 230.

Vickers Viscount 701 (four Rolls-Royce Dart 505). Entrant: British European Airways. B.E.A. are to be congratulated upon their decision to release a Viscount from scheduled service. It is not yet certain either that the aircraft will do proving trials in Australia or whether advantage will be taken of the race condition permitting fare-paying passengers to be carried on the homeward journey. The Dart is still a comparatively new engine, yet for the period of the race the Corporation are prepared to run four in one of their Viscounts at upwards of 13,600 r.p.m. for some 45 hours while carrying a full live load over largely inhospitable territory. There could be no better demonstration of the qualities of the Rolls-Royce turboprop than this, and certainly no other country has a transport turbine capable of emulating the feat. The Viscount itself offers a comfortable ride at upwards of 20,000ft over stage lengths of 1,000 miles, cruising at 300 m.p.h. It is believed that the constant in the formula will be increased to 57 for the Viscount but, even so, the handicap speed should not be more than 250 m.p.h. provided the payload is established at over 12,000 lb.

Handley Page Hastings C.3 (four Bristol Hercules 737). Entrant: R.N.Z.A.F.; captain: W/C. R. F. Watson. The New Zealand Hastings is the only aircraft based at the other end of the race. With a 15,000 lb payload, it should be capable of 2,000 mile stages at 260 m.p.h., yet the handicap speed works out some 30 m.p.h. greater than this.

Douglas DC-6A Liftmaster (four Pratt and Whitney Double Wasp CB-17). Entrant: K.L.M. Royal Dutch Airlines. These "stretched" DC-6s have a potential which belies their conservative appearance. The 6A freighter—of which K.L.M. should have two by October—is certificated at 105,000 lb all-up, and can put over 4,000 gallons into its wing. Even with the announced 68 passengers (and probably two crews) on board, the big Douglas should need only three refuelling stops. Assuming a 20,000 lb payload, the handicap speed is 290 m.p.h., which is just within its capabilities.

Speed Section (in order of increasing all-up weight):—

Supermarine Spitfire F.24 (Rolls-Royce Griffon 61). Entrant: American Aircraft Corporation; pilot: Peter D. Freytag. Flying this aircraft to New Zealand is likely to impose upon Mr. Freytag pre-1939 pioneering methods. Navigation, for example, may be a problem, and after his two-day flight, he is likely to suffer from fatigue; autopilot or not, sleep in the air is unlikely. The aircraft should be capable of stages of over 1,200 miles at 330 m.p.h.

Commonwealth Aircraft Corporation Mustang (Packard Merlin). Entrant and pilot: F/L. J. L. C. Whiteman (Australia). The Australian-built Mustang corresponds to the American F-51D, capable of a 2,000-mile range at 330 m.p.h.

De Havilland Hornet F.3 (two Rolls-Royce Merlin 130/131). Entrant and pilot: C. H. Goodlin (U.S.A.). Several Hornets are privately owned in North America; this aircraft, with long-range tanks, is likely to fly 2,500-mile stages at 350 m.p.h. (using 115/145 grade fuel) and will compete with the Twin Mustang for the honour of putting up the fastest piston-engined time of about 40 hours. "Slick" Goodlin is one of the most famous American racing pilots.

Republic F-84G Thunderjet (Allison J-35A-29). Entrant: Royal Danish Air Force. This Thunderjet is one of a number recently supplied to Denmark by M.D.A.P., and its engine will be the only American turbine in the race. Even carrying four 230-gallon external fuel tanks, the range is but 1,200 miles; 520 m.p.h., however, is an easy cruising speed. Flight refuelling is permitted, and the Thunderjet will no doubt take advantage of it if facilities can be arranged. Otherwise, 13 fuelling stops appear desirable.

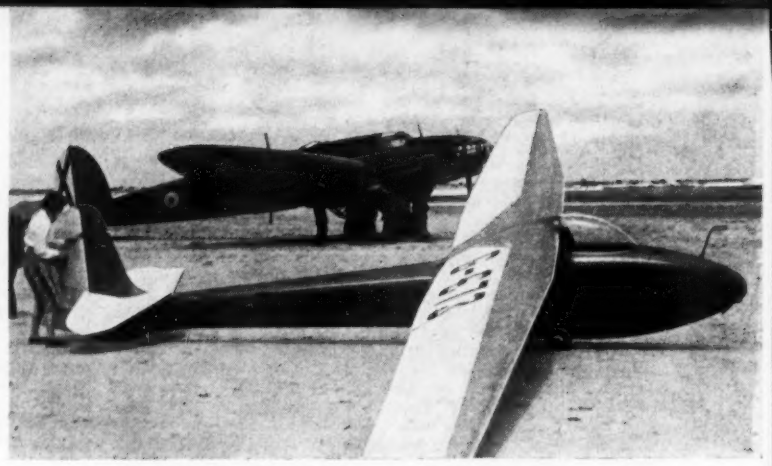
De Havilland Mosquito FB.41 (two Packard Merlin 69). Entrant and pilot: A. J. R. Oates (Australia). *D.H. Mosquito* (engines unstated). Entrant and pilot: Capt. J. Woods (Australia). Two thousand miles at 300 m.p.h. is within the capabilities of a good Mosquito; Mr. Oates' aircraft is one of the Australian-built Mk 6 derivatives with two-stage engines.

North American Twin Mustang (two Allison V-1710-143/145). Entrants: Major H. I. Hill (also pilot) and J. L. Dyer (U.S.A.). Major Hill will fly alone in the cockpit in the left-hand fuselage. The long-range performance of the aircraft is likely to be matched only by the jets and the Hornet. The highly boosted Allisons will need special petrol, which may raise refuelling problems.

English Electric Canberra B Mk 2 (two Rolls-Royce Avon 1). Entrant: R.A.A.F. *English Electric P.R. Canberra* (two Avon). Entrant: R.A.F. The Australian entry is of two B Mk 2 aircraft, while the Royal Air Force have entered three photo-reconnaissance versions. The latter aircraft, significantly, are of unspecified mark number and power plant. Discounting air refuelling, the Canberra should be able to do the journey with fewer than six stops and, even if we have already seen the full potentiality of the Canberra P.R.3 (page 223 of last week's issue), a time of 25 hours appears a possible minimum. Unfortunately, the Basra area, where a compulsory check point is to be situated, is rather too long to accomplish in one hop from London.

Vickers-Armstrongs Valiant B Mk 1 (four Rolls-Royce Avon). Entrant: R.A.F. Officially stated to "beat the Canberra in range and speed," the Valiant should be able to outclass all comers in an event of this sort. The Avons, reportedly of 10,000 lb thrust each, offer excellent economy at the great cruising height of the Valiant, and 3,000-mile stages should be possible without recourse to flight refuelling. Thus, apart from the Basra check point, Rangoon and Darwin should suffice for refuelling, using the normal airline runways. Entering a Valiant will be costly, but this is as nothing compared with the training value of the trip, both to the crew and to the Air Staff.

GLIDING PROGRESS



World-beating sailplane: Pictured here in Spain is the Slingsby Sky in which Philip Wills won the world single-seat championship. Development of the Sky marked a notable phase in British gliding.

Fifteen Years' Development Reviewed in R.Ae.S. Lecture by A. H. Yates

IN 1937, before the Royal Aeronautical Society, G/C. G. M. Buxton presented a comprehensive summary of sailplane development up to that time. To give a similar review covering the years between that lecture and the present time was the object of a "section" lecture by Mr. A. H. Yates, B.Sc., A.F.R.Ae.S., given at the Society's headquarters in London on February 17th. Mr. Yates is a senior lecturer in aerodynamics at the College of Aeronautics, Cranfield; an instructor at the London Gliding Club; and joint owner of an Olympia high-performance sailplane. We present here a shortened account of the meeting at which Mr. Yates' paper was presented and discussed.

After a short introduction by the chairman, Mr. K. G. Wilkinson, B.Sc., D.I.C., A.F.R.Ae.S., Mr. Yates began by referring to G/C. Buxton's 1937 paper. In following this up with his own contribution, he continued, he would not touch on matters of gliding administration, as these were well looked after by the British Gliding Association. Design and performance would be considered, and in this, small effects (compared with powered aircraft) were of importance, as the glider in flight sustained itself on some 2 h.p. only, obtained in some manner from the air.

Although not at present subsidized in this country, the gliding movement had received a subsidy of £5,000 per year for two years during the pre-war period. During this time, the four leading countries on the basis of gliding records gained and construction ability were Germany, Russia, Poland and Britain, in that order. The 1938 German Meise design was an important mark in high-performance sailplane development, after which little progress was made during the war years. After the war, Slingsby and Elliotts had been the two British firms which had produced this country's machines: the latter company had modified original German designs with much success. An important training development had been the introduction of dual-control machines for primary instruction. In the high-performance category, the Slingsby Sky had proved its worth conclusively at last year's international contests in Spain.

The speaker then apologized for omitting the progress graph, customarily a feature of so many lectures before the Society, but emphasized that progress, nevertheless, had been good.

Turning to structural design, Mr. Yates emphasized the strict strength requirements which now existed. In general, progress on the structures side had been disappointing, and wooden construction was still generally used, although the use of metal had been commenced on a small scale. The use of plastic was being investigated, and a Durestos wing was being developed by the B.G.A. with support from the M.o.S. and the Kemsley Flying Trust. The field of detail design offered much scope in glider development, and here there had been good progress.

On the aerodynamic side, the lecturer continued, developments were many and varied, and things were even more hopeful. The requirement was for a low sinking speed (approximately 100ft/min) which, to be obtained at a relatively low forward speed, would need a cambered aerofoil. To obtain a low sinking speed at high forward speeds, however, highly cambered surfaces had to be avoided. Variable camber, obtained possibly by the use of flaps, could produce advantages at both ends of the speed scale, but could result in a drag increase and in structural difficulties.

The angle at which the wing is mounted on the fuselage could also vary. If a particular design gave a level fuselage attitude on landing, the pronounced nose-down attitude at high speed would add drag; while a level fuselage attitude at high speed (such as that on the American RJ5) would cause a tail-down landing attitude and difficulties on take-off. Turning to specific machines, Mr. Yates then pointed out that the RJ5 possessed a lower drag coefficient than any other aeroplane. Featuring aluminium alloy wing construction and a wooden fuselage, it had the very high gliding ratio of 40 : 1, but the faired skid had not proved sufficiently robust for the rough landings experienced in Spain. Other interesting types seen at the Spanish contests had been the all-metal Schweizer 1-23, the tailless Horton XV, and the Castel-Mauboussin CM 815 fitted with butterfly tail and wing-tip fairings (positively *not* tip-tanks for fuel).

Important developments had taken place in the realm of performance research in the U.S.A., the lecturer continued. In particular, Prof. August Raspet, at the Mississippi State College, had studied the question of boundary-layer control. One intriguing method of charting the extent of the laminar boundary layer over the wing of a two-seat glider had been by simply listening to the boundary layer. A pitot tube was fitted at the end of a long movable probe which was connected at its other end to a stethoscope and the listening observer. Normally, transition was found at about 30 per cent of the chord.

Attempts to increase the proportion of laminar flow were made be means of a suction slot near the trailing edge, which was not very effective; and by applying suction through a porous wing-surface. This surface contained a large number of 0.018in and 0.010in diameter holes, and, at the price of the power necessary to provide suction, did enable the transition point to be pushed back to about 90 per cent of the chord.

The effect of the position of boundary layer transition on the minimum drag coefficient was striking; the comparable figures being 0.016 for completely turbulent surface; 0.010 for transition at 50 per cent (wing) and 30 per cent (fuselage); 0.002 for completely laminar wing—or 0.004 allowing for the suction power required. This suction, it had been suggested, could be provided by a hollow-bladed propeller, windmilling at the trailing edge of the wing.

For high performance, a good wing section was essential. If the wing were reasonably clean, dust would not affect the efficiency, but waviness would, and so a very smooth finish was required, an example of the accuracy order being 0.0025in in 2½in. With a highly efficient machine, flight by human power would be possible, as the power necessary to sustain flight could be reduced to as low a figure as ¼ h.p. Another requirement for high performance was a high aspect ratio, with an elliptical wing-loading. If wing twist was used to avoid tip-stalling, down-loads might be experienced at high speeds, and Prof. Raspet had stated that wing twist could be minimized, provided care was taken over the tip section.

By fitting tip-plates, the effective aspect ratio could be increased, and hence the drag reduced—but this effect would not be very great with a normal aspect ratio of about 25 without plates. It seemed, therefore, that the wing-tip fairings on the Castel-Mauboussin machines would not appreciably improve the gliding performance, and no evidence to the contrary had been found.

The question of control in cloud had been an important one in 1937, Mr. Yates pointed out, and remained important today. Efficient dive-brakes had been developed over the past 15 years. Of all aircraft, gliders flew in the most turbulent places, and should therefore be stable—and it was a fact that handling characteristics had improved and stability had greatly increased. To increase the rate of roll, it had previously been thought necessary to use large-span ailerons, but it had since been found that by locking the central half and using outer ailerons only, rolling was at a greater rate. There remained some doubt on this point.

The speaker dealt next with cockpit instruments. In the old days, he said, the two basic instruments had been the turn-and-bank and air-speed indicators. These gave a lag, however, in their response to variations in attitude, and although one admittedly could gain much by the sound of the sailplane's flight, it was, nevertheless, a good thing that an increasing number of sailplanes were now fitted with artificial horizons. Their really widespread use was inevitable. The problem of power supplies had been

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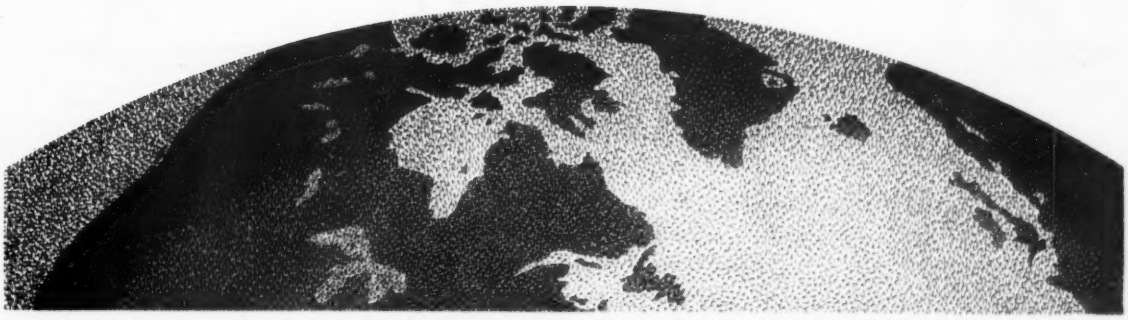

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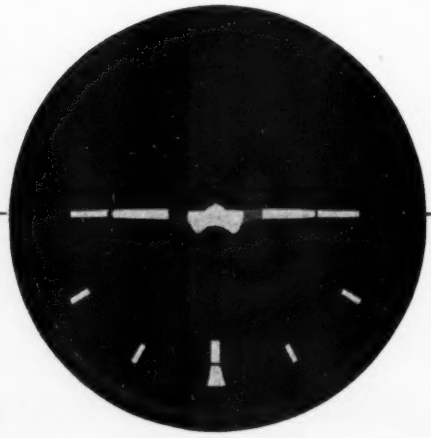

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Contrasting types seen at the International Contests. (Left) a Horten XV tailless machine, entered by Argentine, which has a retractable undercarriage. (Right) the French Castel-Mauboussin, in which Gerard Pierre obtained second place to Philip Wills; note the vee-tail and wing-tip fairings.

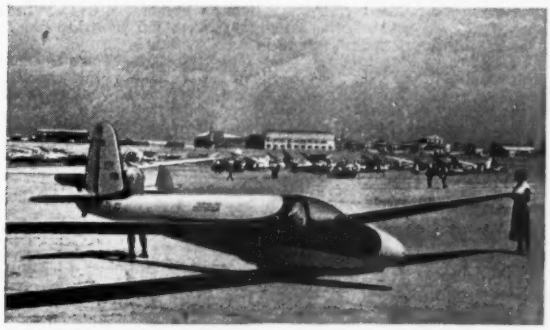
GLIDING PROGRESS . . .

brought up, however, and silver-zinc electric storage batteries had been developed of a high power/weight ratio, but were at present rather expensive.

A new variometer (or rate of climb indicator), interconnected with the A.S.I. had proved useful in distinguishing between a climb caused by rising air and one caused by back pressure on the control column. Only the former was now shown by the instrument as a climb, which was an improvement. Items of radio and oxygen equipment have also been progressively improved.

Advances in meteorological knowledge had been greatly assisted by gliding activities. Theoretical calculations on hill lift and high-altitude effects were now supported by much experimental evidence. The danger of downcurrents had an important application in determining safety margins for powered aircraft flying over mountains. Little progress had been made concerning thermal soaring, and pilots today were in no better position to find thermals than they were 15 years ago.

But the progress of gliding in general had been notable over the period considered, and the movement was now in a very strong and virile position. Whether assistance by subsidy would improve matters was uncertain. Gliding, Mr. Yates concluded, had made an important contribution to scientific knowledge, and it was heartening that Britain now led the world in this branch of flight.



Top U.S.A. competitor in Spain was Paul McCready in the Schweizer 1-23, which was placed 6th. This machine is of all-metal construction.

The Discussion

Following the lecture came a period of questions and discussion, in which many of Britain's leading gliding personalities took part.

The first question concerned tip sections. Designers had been slow to learn from early wartime experience, one speaker claimed, and went on to suggest that a small motor—silenced, of course—be used to provide the suction for boundary-layer control.

Philip Wills, holder of the world single-seat gliding championship, was the second speaker in the discussion; he foresaw the second occupant of two-seat machines pedalling madly to provide motive power, in the not-too-distant future. Plastic construction might well prove expensive, he continued, and for high-performance machines, low-speed flaps—or better winches—were essential.

G/C. Buxton, author of the 1937 paper, was also among the audience, and expressed a high regard for wood as a material for sailplane construction, for lightness was a most important consideration. Concerning stability, he stated that responsiveness had been the aim "in the old days."

Mr. B. S. Shenstone, M.A.Sc., A.F.I.Ae.S., F.R.Ae.S. (chief engineer, B.E.A.) spoke of the difficulty of obtaining good detail design in sailplanes. A manufacturer must have an active interest in gliding, a manufacturing shop, and money, to produce really good work, and this combination was not always available.

Other questions concerned the problem of aileron design, variable-dihedral tests, and the suggested over-severe strength requirements. Discussion continued on the development of particular instruments, the handling characteristics of various machines, and the possibility of compiling a thermal map of the country. Summing up, Mr. Yates emphasized the need for further extensive tests on many problems, and mentioned the possibility of foam-filled sandwich wing construction.

D-DAY RECALLED

WAR cameramen were out in force on D-Day and, as might be expected, many spectacular pictures were obtained recording that momentous event. Some of the best of these were included in *Operation Overlord*, episode 15 of the B.B.C. Television film *Victory at Sea*.

The invasion gave the Allied Air Forces their busiest-ever time, their duties being defined in the commentary as "to provide escorts, lend close support, drop paratroops" and, perhaps most important of all, to wreak havoc with communications and transport as far back as Germany and thus seal off the invasion beach-heads from enemy reinforcements.

The more spectacular air sequences included a Marauder receiving a direct hit on its tail and disintegrating, and a Hadrian glider lurching on to its nose, tail vertical, after a bad landing.

Other air shots showed Fortresses, Stirlings and Lancasters on daylight missions, Ju88s and FW 190s being shot down, Dakotas tugging off Horsa and Hadrian gliders, Typhoons rocketing-up ground targets and a formation of Bostons hedge-hopping on their way to attack "every road, every bridge and every railroad leading into Germany." Within a week of D-Day the United States launched a major offensive in the Pacific, aimed at the reconquest of Guam and other islands in the Mariana Group, and this was covered by episode 16. Softening up strikes by carrier based Corsairs were shown, together with excellent shots of Avengers and Hellcats taking-off and of carriers packed tight with aircraft.

Many hitherto unseen shots taken from Japanese films were included in this episode and some of the later types of Japanese aircraft were seen for the first time in the series.

The Marianas are some 1,500 miles South of Tokyo and the recaptured islands were quickly converted into bases for attacks on the Jap mainland. Guam became the advance H.Q. of Admiral Nimitz. £70,000,000 was spent building a harbour and within months huge airfields had been built and such a vast amount of war material poured into the island that it became the mightiest arsenal of all time. Row upon row of tanks, lorries, guns, and even rows of huge warehouses, all filled to capacity with every imaginable piece of equipment, were seen in the film.

THE LORDS DISCUSS PRODUCTION

—*Civil* v. *Military Priorities, Naval Aviation and Other Matters*

CAUTIOUS optimism that Britain would be able to exploit her lead in the field of aircraft design was perhaps the main impression to emerge from a debate in the House of Lords on February 7th, when Lord Ogmore sought information about present arrangements for the manufacture and supply of military and civil aircraft.

Contrary to expectation, the bogy of nationalization was not invoked to any great extent, but serious doubts were expressed on the financial aspect of the task now confronting the industry. In the military field, particular emphasis was placed on the progress —or otherwise—of Naval Aviation.

LORD OGMORE devoted much of his speech to a survey of the contemporary position, and an attempt to establish the precise demand for civil and military aircraft, both at home and abroad, and the extent of our ability—in terms of materials, factory space, men, and finance—to meet that demand. He began by referring to the diversity of types reflected in current military production, and stressing the need for rationalization in respect of the latest bombers. He maintained that it was necessary not only to have bombers and fighters, but also a good sound civil aviation industry with stability of production and employment. He estimated that, with peak production of 70 Comets and 100 Viscounts a year, there would be an annual trading result of about £200 m in five years.

With regard to finance, he noted that both Rolls-Royce and Hawker Siddeley had had to increase their capital, and mentioned a proposal, current in the industry, that the Government should consider some sort of development contract to the manufacturer, with recovery to the Government of an agreed sum for each aircraft sold.

LORD DE L'ISLE AND DUDLEY, Secretary of State for Air, suggested that the aircraft industry was playing in our economy a part comparable with the old-established shipbuilding industry. It was a striking fact that, in 1952, aircraft exports totalled £43 m, which just about equalled our exports from the shipbuilding industry. It was hoped that in the current year the figure would rise to £60 m; perhaps in ten years, if not in five, Lord Ogmore's figure of £200 m would be achieved.

The Minister then remarked that it would be wrong to be either over-optimistic or to set one's sights too low. But he refused to commit himself as to whether the industry had a lead of three, four, or five years over its competitors. Certainly it was to be expected that the great range of civil aircraft now in production—Comets, Viscounts, and Britannias—would not much longer remain, as they were today, unique in their class. Nevertheless, he thought that the industry's record with these latest types of civil aircraft was a good one, and he did not believe that the two-year production period for, say, the Comet 2 was excessive. It was not expected that these aircraft could be made for sale "off the shelf," for the capital risks implicit were too great for any firm or Government to contemplate.

He went on to assert that the time-lag between order and delivery was not due to lack of manufacturing capacity. Vickers-Armstrongs, for instance, could see their way to increase production of the Viscount, if necessary, up to 100 a year—the highest production ever contemplated for a big civil aircraft, either in America or in Britain. Nevertheless, using all the manufacturing techniques of a great concern, the cycle of production would still be about 24 months.

Dealing with sub-contracting, Lord De L'Isle and Dudley said it was the Government's policy to encourage it, although he could discover no cases where production was being held up because of the omission to sub-contract.

Civil-aircraft Production

He then turned to the main emphasis of the Government's civil-aircraft production policy, which had been that of easing the industry's tasks in respect of labour and materials, and he was glad to report progress in both those fields. Nearly every firm in the industry had increased its labour force during the past year and, all told, the total number employed in the industry rose during 1952 to 30,000—i.e., by 17 per cent. Similar progress had been made on housing and, with the co-operation of local authorities, some 4,000 houses had been provided for aircraft workers, of which 3,000 were for firms engaged either partially or wholly in super-priority work. Behind these schemes there had been a general policy of trying to attract labour—particularly skilled labour—to the firms.

Commenting on super-priority, the Minister said the scheme had really worked. He did not think that surprising, as there was a valuable record of good relations between Government and the industry. Over the super-priority period mutual respect and confidence had been built up and the functions of each side were, if not easy to define, well understood. It was true, as Lord Ogmore had said, that the Government must play a big part in the civil field of the industry, and the general rule was that the Government financed the prototypes of large civil types of aircraft, a proportion of the proceeds of sales being paid by the firms to the Government. This proportion was calculated on the assumption, after market research had been done, that a stated number of aircraft would be sold. The keynote of this whole set-up was partnership, as exemplified in the joint enterprises represented by the Ghost, Avon, Proteus and Sapphire engines.

The system achieved results, and he could not believe that any greater control by the Government—certainly not nationalization—would be of benefit to the industry. Healthy rivalry and competition between firms, more especially in design, was at the root of the great advances made since the war.

Discussing rationalization of bomber types, the Minister assured the House that the three medium bombers—H.P. 80, Valiant and Vulcan —did not, as had been suggested, cost £1 m each, but somewhere between £300,000 and £400,000. Until the matter could be tested, no one could say which of the later high-performance bombers, H.P. 80 or Vulcan, would be the most suitable. Both might be suitable for highly different but critical purposes. No one could tell which aircraft had the most development in it, and he hoped to discuss the whole matter in the forthcoming debate on the Air Estimates.

LORD PAKENHAM confessed himself uncertain as to whether the industry was taking advantage of the opportunities now open to it. He believed it was within their power to "collar" the jet market for a generation, but it would need a great increase of effort. He was similarly dubious about the Minister's assurances on workers' housing.

On the question of finance, he was doubtful whether it was within the power of any single firm, unaided by the State, to launch out on the scale which the fleeting opportunity demanded, for it was important that the industry should be able to produce on a large scale before having firm orders. There was a case, he suggested, for some form of State assistance. It might be some sort of guarantee for aircraft produced for export purposes, or for the development of the Comet 3 and 4. In any event he hoped the idea of some new partnerships between the State and industry had not been abandoned.

Touching on the subject of naval aircraft, Lord Pakenham said that a comparison with the aircraft of other countries indicated that Britain came out of it rather badly.

An Assortment of Views

LORD TEYNHAM concurred, and spoke of "something lacking" in the Admiralty at present. It might be a good thing, he said, to expand the Corps of Naval Constructors and have attached to it a Corps of Naval Air Constructors. That would be likely to lead to a much more continuous programme of design of naval aircraft. He urged the Government to extend super-priority to include naval fighters.

LORD STRABOLGI drew attention to the woeful shortage of labour caused by lack of housing. Many people were uneasy, he said, that the Government were still adhering, or were allowing local authorities to adhere, to those regulations which were hampering the policy of moving the factories to those places where labour was to be found.

He was also disturbed by the fact that a modern British freight-carrying aircraft was not available, and that our operators had not been allowed to purchase American aircraft—as were K.L.M., through the World Bank with backing from the Dutch Government.

Dealing with military aircraft, Lord Strabolgi suggested that in Korea a rather cheaper and simpler type of piston-engined aircraft, specially designed for use with the troops in the field, was required in preference to the expensive, complicated and delicate jet fighter-bomber.

LORD SEMPILL urged that skilled manpower and space made available by recasting of the defence programme should be used immediately to produce civil types of aircraft.

LORD WINSTER said that the aircraft firms, and the men who worked in them, had presented the Government with a chance of a lifetime. Was the Government, in turn, producing the man and the men to take advantage of the opportunity the aircraft designers were presenting to it? He hoped that, now the Transport Bill was passing out of the way, Mr. Lennox-Boyd, the Minister of Transport, would be able to place the imprint of his forceful and resourceful nature on the field of civil aviation.

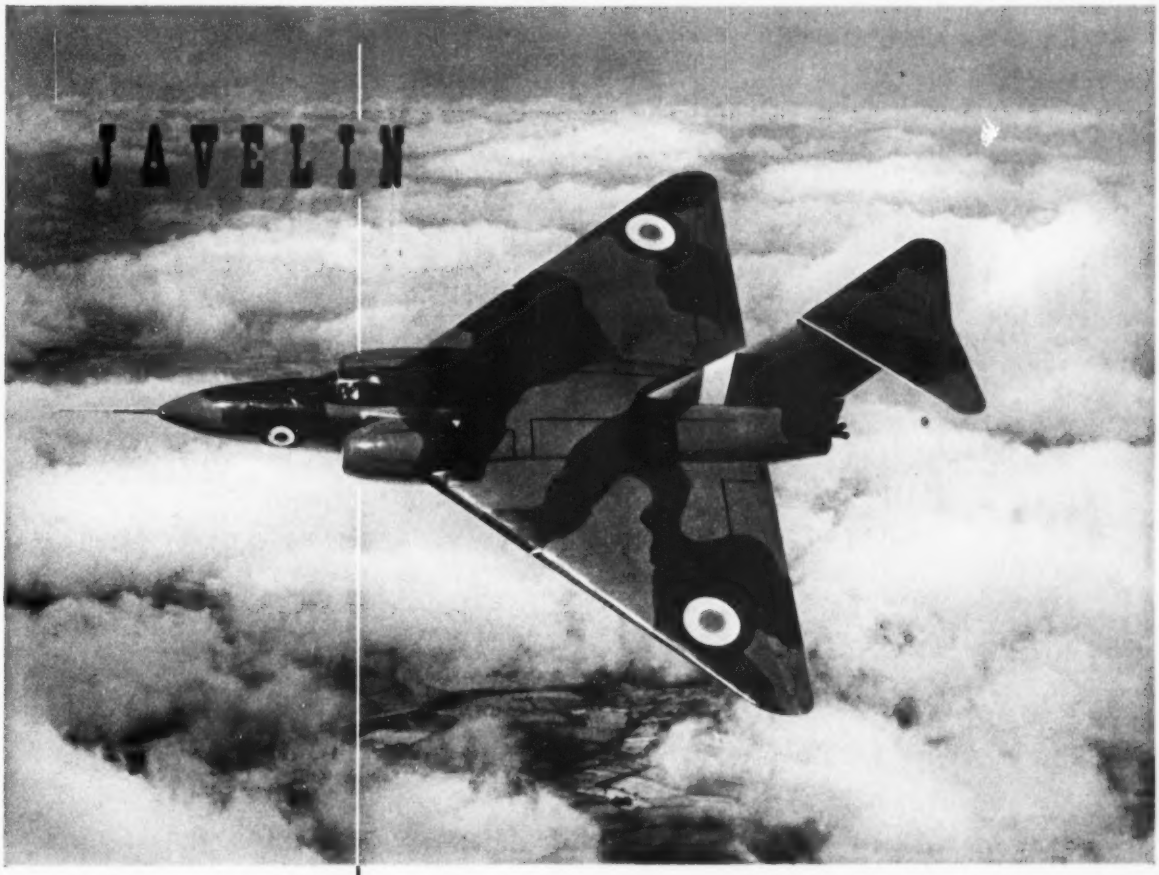
Lord Winster drew an analogy between air services and the great shipping services. When we were building up our great shipping industry, he said, there were captains of tramp steamers who had a reputation for being able to smell out a cargo in the most unlikely and remote parts of the world. That same instinct was wanted in the air-freight business today, and that was a line of country particularly suited to some of the independent operators. What the industry required today was the assurance of firm orders from the Government for such aircraft as the Comets and Britannias, so that if orders came along the goods would be there for delivery when firm enquiries were received. It was too much to ask the firms to shoulder all the finance, and the granting of Government assistance was not something absolutely unusual.

Lord Winster then made a passing reference to the Ministry of Supply, and wondered whether, as at present constituted, it would take the strain which would be imposed upon it in war-time. He felt the Ministry should be so organized in peace-time that it would be able to take on war tasks and duties without having to undergo a great deal of reorganization.

LORD DOWDING described "in a nutshell" why the Navy never had the best aircraft: it was because they would insist on fighters, which were designed for performing quite different tasks, and sometimes tasks which were almost mutually exclusive. First-class aircraft could not be secured if such divergent roles were demanded, and he believed the basic reason was that, during the war at any rate, the Admiralty did not have in the high positions people with practical experience.

LORD MANCROFT, replying for the Government, said he had been asked point-blank to say whether the Government were satisfied with the present state of naval aviation. The answer to that, point-blank, was "no." Any government would have to give the same reply, but he

(*Concluded on page* 259)



ejection seats

The Martin-Baker Mk. 2 *fully automatic* Ejection Seat fitted to the Gloster Javelin and now in production, is designed to reduce escape procedure to the minimum.

Once ejection is made, the complete sequence of releases from the seat are automatic and no further action by the occupant is necessary.

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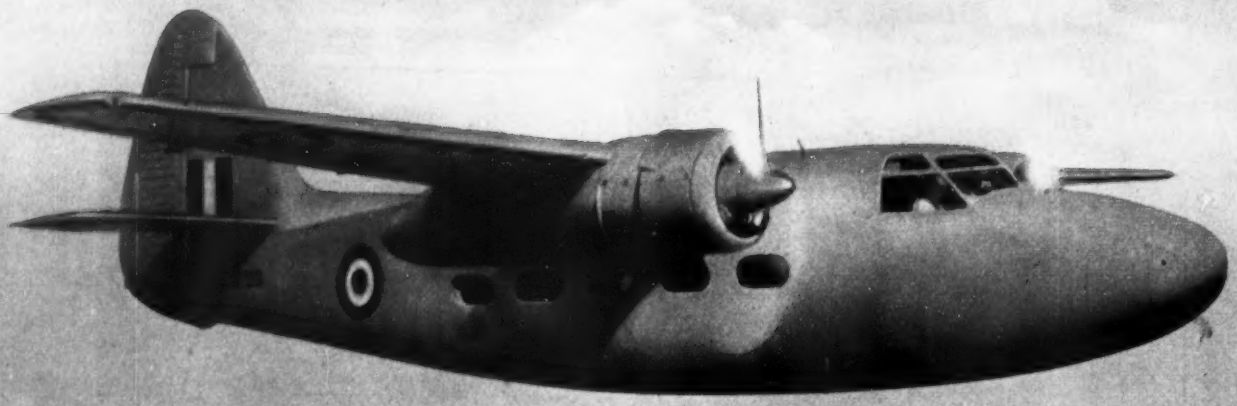
The propellers of the Pembroke



The Percival Pembroke general-purpose military aircraft, in production for the Royal Air Force and the Royal Belgian Air Force, are powered by two Alvis Leonides engines driving the well-proven de Havilland three-bladed Hydromatic propellers.

DE HAVILLAND PROPELLERS

PROPELLERS

The rocket-launching tubes of the Avro Canada CF-100 are clearly seen in this striking photograph. The aircraft is a Mk 3 and 27 missiles have already been "rippled" from the starboard launcher. A brilliant exhaust flame is visible as the 28th accelerates from the muzzle.

AIRCRAFT INTELLIGENCE

Great Britain

De Havilland Vampire Trainer. Several nations, including Portugal and South Africa have now received their first deliveries of Vampire dual-control trainers. At home, the Vampire T.11 is firmly established at a number of R.A.F. training schools. In the near future, trainer Vampires will come from de Havillands with Martin-Baker ejection seats of a special compact type. At the same time a new canopy will be introduced of a clear-vision semi-frameless pattern.

Canada

Avro Canada CF-100. Although it at one time appeared unlikely to have much influence on world events, the big CF-100 has now emerged as one of the most useful weapons in any nation's armoury. The most recent CF-100 development—but not an unexpected one—is the installation of wing-tip rocket launchers. The manner in which these missiles can be carried is quite variable; the Starfire carries 24 in the nose, the F-86D Sabre has 24 in a tray under the belly and the F-89D Scorpion has 24 in the nose of each of its large wing-tip tanks. The CF-100 has easily the most advanced installation yet revealed. The outer wings each house thirty rockets (2.75in folding-fin unguided weapons) which are fired from wing-tip launching tubes. The only other "belt-fed" installation of this nature yet announced is that of the Aero X-10 U.S. Navy rocket in the wings of a Skyraider in 1949. The total of 60 rockets carried by the CF-100 is shortly to be increased to no less than 100, when minor structural modifications have been carried out. Early CF-100s were armed with four fixed 30 mm cannon—which may be retained to supplement the rockets. The supersonic Mk. 4 aircraft also feature an interesting tray under the belly.

Ornithopter. The latest team to attempt to develop a workable ornithopter (flapping-wing aircraft) consists of J. E. Caldwell (engineer), H. D. Shannon (constructor) and W. Francis (pilot). All three are of Medicine Hat, Alberta. Their design, which is now ready for a trial flight, mounts two wings on either side of the pilot. The wing upper surface is uncovered, while the lower skin is formed from hinged plastic foil strips which open on the "up-stroke" and close on the downward beat.

U.S.A.

Bell Helicopters. The prototype Bell XHSL-1, a large anti-submarine helicopter with twin tandem rotors driven by a Double Wasp, is now ready for initial flight trials. The type is scheduled for ship-borne service with the U.S. Navy. Also at Fort Worth is a project for a civil-transport development of the XHSL powered by two Allison T-38 turboprops; this would have a larger fuselage, for some 50 passengers.

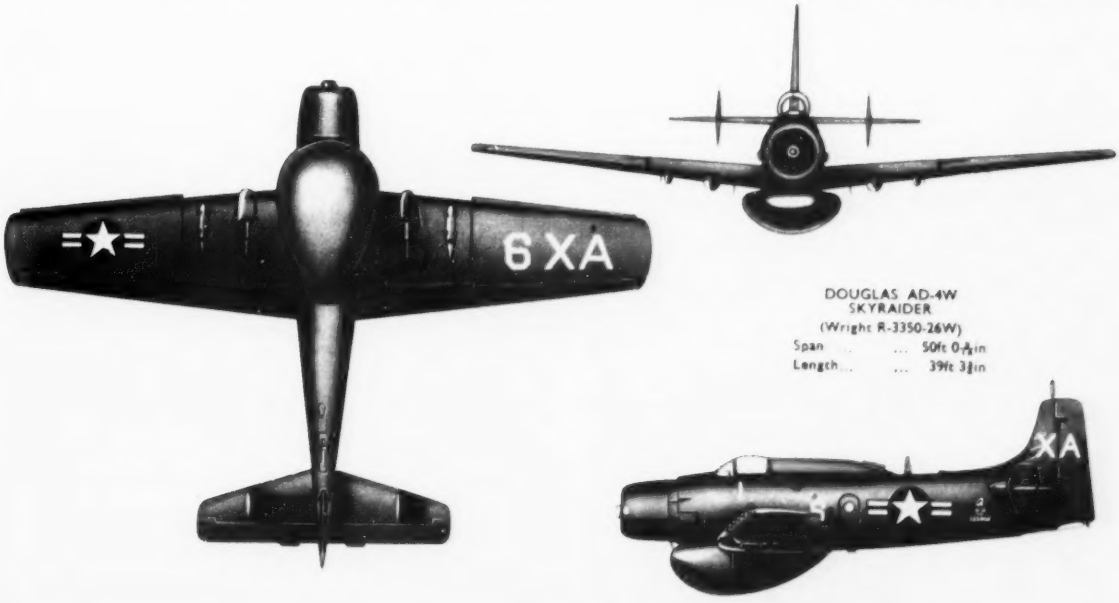
Japan

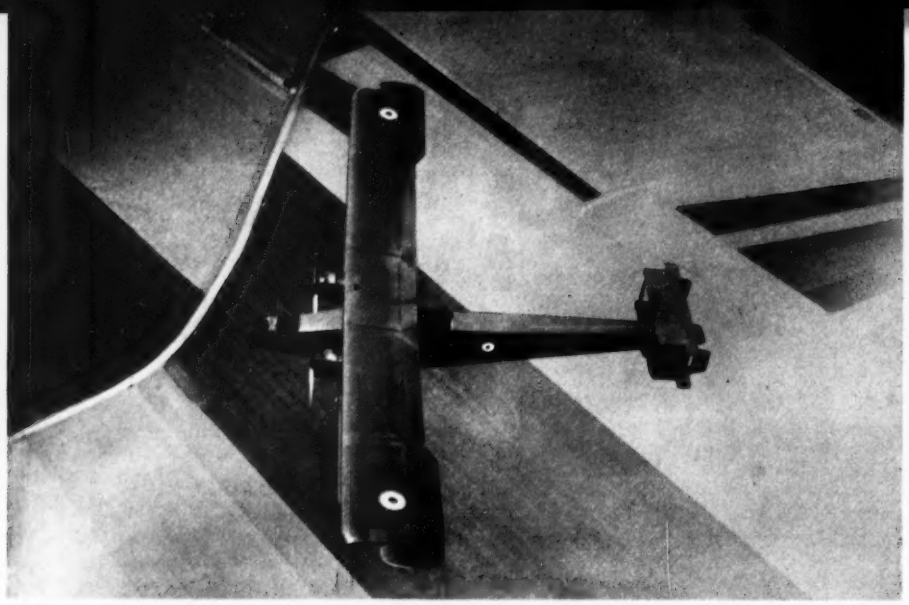
New Projects. According to the Japanese Aviation Research Organization, the design staffs of Fuji Industries (formerly Nakajima) and Shin Mitsubishi have both started design work on aircraft for the forthcoming Japanese Air Force. The former company is developing a basic trainer with a 450 h.p. Pratt and Whitney Wasp. Mitsubishi are developing a similar, but more powerful, trainer and are also negotiating with North American for the assembly of T-28 (Harvard development) trainers at their Komaki plant. At a cost of $72,000 each, the T-28s would go to the Japanese National Safety Force.

Miscellaneous

Flying Saucers. Stories of these mysterious vehicles are legion; only rarely, however, is such a report coupled with the name of a manufacturer. Particular interest is, therefore, attached to the following two announcements. In the first case, Radio Belgrade stated that a number of flying saucers flew over a Belgrade suburb on February 15th. They were, it appears, developed by the research department of the Jugoslav Air Force and had the following characteristics: diameter, 40 in; all-up weight, 4½ lb; top speed, 31 m.p.h. with radio control. A further display is "scheduled for Marshal Tito's birthday".

The second report is of a much more ambitious project. No less a firm than Avro Canada is involved, for at their Malton, Ontario, factory they are alleged to have a wooden mock-up saucer under "super security" guard. Reports have it that the diameter will be 40 ft, the speed 1,500 m.p.h. and that vertical take-off will be possible. Plans of the project have "been studied by the British Air Ministry".





Vividly recalling the distinctive plan-form of the 0/400, this photograph was taken over German territory in 1919.

HANDLEY PAGE 0/100 and 0/400

Historic Military Aircraft : No. 4

By J. M. BRUCE, M.A.

IT was largely at the insistence of Mr. (now Sir Frederick) Handley Page, later supported by a far-sighted senior officer in the Admiralty, that the Government became convinced, early in the 1914-18 war, of the value of the really big aeroplane as an offensive weapon. The famous Handley Page bombers were the outcome, as described in these pages. This is J. M. Bruce's fourth contribution in the series of famous military aircraft of earlier days; the others appeared, respectively, on October 17th last (D.H.4), November 7th (Bristol Fighter) and December 12th (the F.E.2).

BRITISH naval aviators took an interest in bomb-dropping from aeroplanes at an early date. In January 1912, even before the Naval Wing of the Royal Flying Corps came into existence, Lt. H. A. Williamson, R.N., submitted to the Admiralty a paper in which he proposed the use of aeroplanes operating from a parent ship for the detection of submarines; and a further proposal made by him was that submarines should be attacked by means of delayed-action bombs dropped from the aircraft. Later in 1912 a dummy 100 lb bomb was dropped by Cdr. C. R. Samson from a Short pusher biplane to determine the effect which the releasing of such a weight—very considerable in those days—would have on the trim of an aircraft.

Experiments were continued by the Air Department of the Admiralty, and in March 1913 Lt. R. H. Clark Hall, a naval gunnery lieutenant, was appointed for armament duties with the Naval Wing. In December 1913 experiments were carried out to determine the minimum height from which bombs could be dropped by an aircraft without risk of damage from the explosions. At that time no bombs of suitable weight were available, but floating charges containing from 2½ to 40 lb of explosive were detonated electrically from a destroyer while Maurice Farman floatplanes were flown at various heights over the explosions.

At the time of the outbreak of war the only bomb available for use from British aircraft was the 20 lb Hale, of which the R.N.A.S. (as the Naval Wing had become on July 1st, 1914) possessed the imposing total of 26. One or two 100-pounders had been made by the Royal Laboratory at Woolwich, and a number of 6in shells were hurriedly fitted with tail-vanes and converted into bombs. A few days after the declaration of war successful trials were carried out with an incendiary bomb invented by Lt. C. R. Finch-Noyes of the R.N.A.S. The incendiary and the Royal Laboratory 100-pounder went into production, followed later by the Hale 100 lb bomb and the Royal Laboratory 112-pounder.

Since officers of the Naval Wing and R.N.A.S. had been largely responsible for the early development of bomb-dropping in this country, it was not inappropriate that the Air Department of the Admiralty should also be, to some extent, responsible for the aircraft capable of delivering the missiles in quantity. The coming of war focused attention on the possibility of using bomb-carrying aeroplanes for oversea patrol, and the official requirements defining a machine for work of that kind were made known in December 1914, in what must have been one of the earliest specifications ever issued for a Service aircraft. It called for a twin-engined aeroplane with a crew of two, capable of carrying six 112 lb bombs at a maximum speed of at least 72 m.p.h.

Before the outbreak of war Mr. (now Sir Frederick) Handley Page had become convinced of the advantages inherent in large aeroplanes, particularly when heavy loads had to be carried. Only the outbreak of hostilities had prevented the completion of the Handley Page L.200, a large biplane with a 200 h.p. Salmson engine, designed for an attempt on the Transatlantic flight. Mr. Handley Page took his proposals for a large twin-engined bomber to Commodore (later Rear-Admiral Sir) Murray F. Sueter, then Director of the Air Department of the Admiralty, who was considerably impressed by the potentialities of the design. The original concept was of an aeroplane having a somewhat shorter nose than the machine had when it was actually built, and the first thoughts on the power-plant were for two Beardmore engines. Commodore Sueter wanted something really potent, however, and asked Mr. Handley Page to provide —the phrase is now classic— "a bloody paralyser" of an aircraft. Mr. Handley Page and Mr. G. R. Volkert revised the design accordingly, and were rewarded with an order to proceed with construction.

Work began at once and continued, seven days a week, until the first Handley Page bomber, designated 0/100, appeared a little less than a year later. This achievement is all the more remarkable because the designers had no previous experience in the construction of large bomb-carrying machines upon which to draw. Nor had anyone else, for that matter. The machine was originally designed to have two 150 h.p. Sunbeams, but two 250 h.p. Rolls-Royce engines were substituted. The engines were mounted in armoured nacelles with the fuel tanks, also armoured, immediately behind them. At one time during its early career the prototype 0/100 had an enclosed cabin for the pilot in the nose of the fuselage, but this collapsed during the machine's first cross-country from Hendon to Eastchurch, and was thereafter discarded.

Great secrecy was observed when the 0/100 made its debut. The machine was transported from Cricklewood to Hendon during the darkest hours of the night of December 17th-18th, 1915: several yards of fencing had to be removed to enable it to get into the aerodrome. It was the largest practical aeroplane which had been built in the country up to that time.

The 0/100 first took the air at 1.51 p.m. on December 18th, 1915, and development for Service use began. In January 1916 the first prototype went to Eastchurch for official trials, and in July of that year an 0/100 created a sensation by climbing to 7,000ft with its pilot (Mr. Clifford B. Prodger) and 20 passengers. In the course of development various modifications were made, including the removal of much of the armour plate. Fundamentally, how-

ever, the machine remained the same remarkable aeroplane, distinguished by its folding wings and substantial undercarriage with independent suspension for each wheel.

The basic structure of the machine, which remained virtually unchanged after development into the O/400, was fairly typical of its period but was carried out on the grand scale. The fuselage was made in three parts: the nose section; the central portion, which incorporated the bomb bay; and the long tail portion. The crew entered the nose section by means of a trapdoor in the fuselage floor. The longerons and spacers of the nose section were of solid spruce; the longerons and transverse spacers of the central section were also of solid spruce, but the lower longerons and spacers were spindled out, and the vertical spacers were hollow; the longerons and spacers of the tail portion were of hollow spruce, with the exception of the tail fairing, the frame of which consisted of solid spruce of smaller section. Each portion was the usual braced box-girder, cross-bracing in the nose section consisting of wire cable; elsewhere tie rods were used. Additional oblique struts were provided to brace each end of the bomb beam.

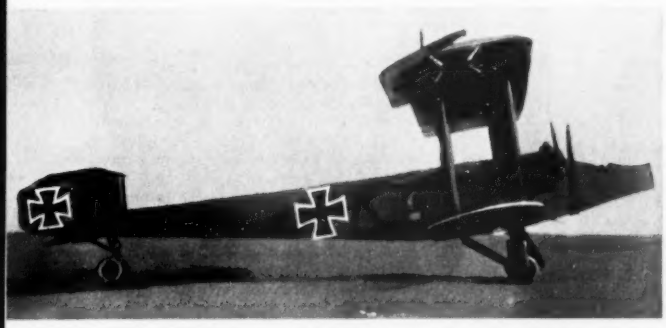
The bombs were carried internally, suspended by their noses. They were selected and released electrically, the type of bomb release which was ultimately standardized on the O/400 being the Salvo Mk 4. Bombs could be dropped in groups of four or singly, and each bomb cell had a spring-loaded door at the bottom which, opened by the weight of the bomb, closed again automatically.

The wings had built-up box spars, the upper wing consisting of five sections and the lower of four. Ailerons were fitted to the upper wing only. The massive interplane struts consisted of two rectangular pieces of spruce hollowed out, joined by ash strips, and enclosed in a streamlined fairing of thin spruce covered with fabric. The mainplanes were hinged at the outer ends of the rear spar of the centre-section to enable them to be folded back along the sides of the fuselage. When the wings were folded, a jury strut was inserted between the inner ends of the forward spars in order to preserve the truss.

The biplane tail unit was a simple box-kite affair, characterised by a single central fin and twin outboard rudders. In the O/100 the fin was mounted so that its leading edge was a little way ahead of the leading edge of the upper tailplane. The incidence of the tailplane could be adjusted while the machine was on the ground: the forward central tailplane-to-fuselage struts had telescopic attachments to facilitate the adjustment. The alteration of the incidence was a task not to be undertaken lightly, for an official report on the O/400 states: "It is a matter of five or six hours' work to alter the incidence and re-true the complete tail unit."

Some difficulties were encountered with the tail control-surfaces.

Early O/100, with experimental elevator mass-balances; alongside is a Bristol Scout C. (Right) Prototype O/100, No. 1455, modified for production.



The captured O/100, wearing its German markings.

The elevators originally had horn balances similar to those fitted to the ailerons, but were not satisfactory, probably due to over-balancing. Attempted remedies included the fitting of two parallel rod-like mass-balances to each overhang of the elevators. The trouble was eventually eliminated, but the Handley Page retained its characteristic overhanging elevators, from which almost all balance area had been removed.

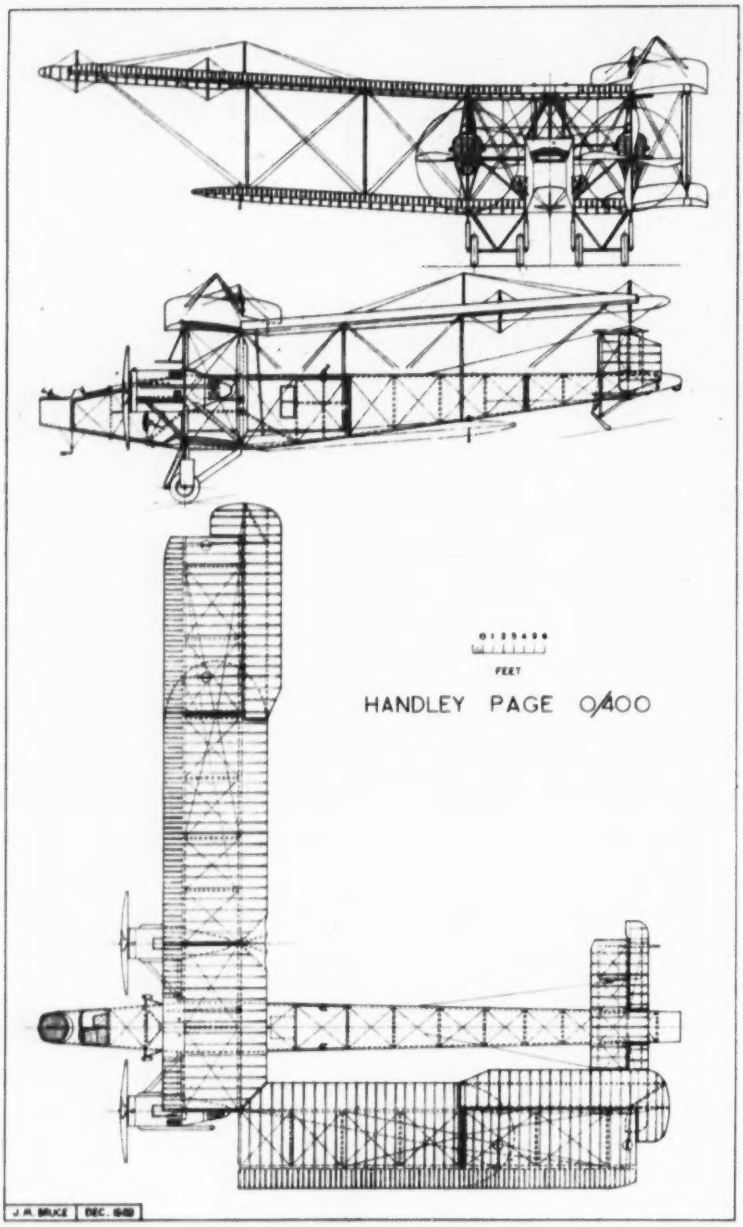
On the prototypes and early production O/100s the Rolls-Royce engines drove opposite-handed airscrews, and the radiators were disposed in two elements mounted externally on each side of the nacelles. Later O/100s had frontal radiators of a characteristic shape with vertical shutters. The tail portion of each nacelle was very long and pointed on the first production O/100s, but was later shortened a little: it was hinged and could be swung sideways to give access to the rear of the nacelle proper. The engine nacelles were constructed of steel tube. The connection of all engine controls between fuselage and nacelle was achieved by means of an ingenious horizontal nest of tubes working concentrically on a steel rod, the whole being enclosed in a wooden fairing.

Forty production O/100s were built, and delivery to the R.N.A.S. began during 1916. A training squadron was established at Manston, and by October 1st, 1916, three O/100s had been delivered there. For operational use the type was first supplied to the Fifth Wing of the R.N.A.S. at Dunkirk, and the first Handley Page to go to France flew to Villacoublay in November of the same year: it was manned by Sqn. Cdr. Babington, Lt. Jones and Sub-Lt. P. Bewsher. The second machine, flown by Sub-Lt. Waller, arrived in France some two weeks later. The third was not so fortunate: by a stroke of remarkably bad luck it was delivered intact into the hands of the enemy.

The hapless crew of this third ill-fated O/100 were Lt. Vereker

Among various O/100 installations were (above) two 275 h.p. Sunbeam Cossacks and (below) four 200 h.p. Hispano-Suizas in tandem pairs.

Excitement at R.N.A.S. station Coudekerque on first sight of an O/100.



HANDLEY PAGE 0/100 and 0/400 . . .

(pilot), Lt. Hibbard (observer), L/M. Kennedy, L/M. Wright and A/M.1 W. W. Higby. The machine first set out on December 24th, 1916, but slight engine trouble necessitated a return to England, and its departure was delayed until January 1st, 1917. At about 11.45 a.m. on that day Vereker again set course for France, followed about 15 minutes later by another 0/100, flown by Sub-Lt. Sands. By the time the machine reached mid-Channel they were over an unbroken sheet of cloud. Sands went down through it and landed safely at Villacoublay at 1410 hours. After circling, Vereker also let down, but with 200ft on the altimeter he was still in cloud, so he climbed again to 6,000ft and tried for some two hours to fix his position. Breaking cloud at 500ft, Vereker landed in the first suitable field and, accompanied by his observer, got out to ask where he was. Then, too late, the 0/100's crew realized they were on the wrong side of the lines: they had landed near Laon. German troops prevented them from destroying the 0/100, and an undamaged example of Britain's latest and finest achievement in aeronautical engineering was thus placed at the enemy's disposal.

It has been said that this 0/100 provided the inspiration for the German Gotha machines, but, examining the facts dispassionately, it is now difficult to accept that theory. It was indignantly denied in the pages of *Flugsport* in 1918—which is not surprising, for as early as 1914 Oskar Ursinus, the editor of that journal, had designed the large twin-engined biplane which was the progenitor of the Gotha line. The Gotha G.III, G.IV and G.V were widely used and all were very similar in appearance to each other, but were appreciably smaller than the 0/100. Apart from the very noticeable structural differences between the Gotha and Handley Page machine, the Gotha began to equip German bomber squadrons from February 1917 onwards, much too soon for the captured 0/100 to have inspired or even influenced their design. Gotha development was likewise free from any Handley Page influence : the Gotha G.VI was probably the world's first asymmetrical aircraft, and the G.VII, G.VIII and G.IX represented a further new line of thought.

No other 0/100s left Manston until early April 1917, when four went to Dunkirk to become No. 7 Squadron of No. 5 Wing, R.N.A.S. The men of No. 5 Wing eagerly welcomed the 0/100 as a replacement for the assorted Sopwith 1½-Strutters, Caudron G.4s and Short Bombers they had been flying. A particular reason for satisfaction was the 0/100's ability to carry anything up to fourteen 112 lb bombs as compared with the Short Bombers eight 65-pounders. No. 7 Squadron's aerodrome was at Coudekerque, and at first its Handley Pages carried out daylight patrols off the coast. They drew blood on April 23rd, 1917, when five German destroyers were reported off Ostend. Three 0/100s, each carrying fourteen 65 lb bombs, attacked : one destroyer was stopped by direct hits and was left listing.

Another similar action three days later caused no visible damage to the enemy and resulted in the loss of one 0/100 which, having gone too far from the escorting machines, was fired on by an enemy single-seater and hit in the petrol tanks. Loss of fuel forced the big machine down on the water, where it was at once fired on by the enemy's coastal batteries. A gallant attempt at air/sea rescue was made by two French flying-boats : one took off the wounded observer of the Handley Page, but the other was unable to get off the water and all its occupants were taken prisoner. An immediate result of this mishap was that the 0/100s were withdrawn from daylight operations and confined to night bombing.

They found their targets at the destroyer and U-boat bases at Bruges, Ostend and Zeebrugge, and on the aerodromes from which their German counterparts took off to attack targets in England. One of the earliest night raids made by an 0/100 was the attack on the railway station at Moulin-les-Metz delivered by a single machine on the night of March 16th-17th, 1917. In those early days nearly all night attacks were made by single Handley Pages : large-scale raids were not practised. Nevertheless, No. 7 (Naval) Squadron built up a store of valuable experience which later helped to convince a reluctant Air Board that night bombers were a valuable weapon of offence. In July 1917 No. 7A Squadron was formed from No. 7 (Naval) Squadron, and by the middle of the following month the two squadrons could muster 20 Handley Pages between them. On December 9th, 1917, No. 7A became No. 14 Squadron, R.N.A.S.

Increased U-boat activity off the mouth of the Tees late in August 1917 resulted in the Handley Page reverting briefly to its original task. At that time no seaplanes could be spared, and a flight of four Handley Pages were sent from Coudekerque to Redcar, where they arrived on September 5th, 1917. For four weeks the machines carried out patrols, during which time they sighted 11 U-boats and bombed seven of them. Although none of the submarines was destroyed, the Handley Page's patrols brought about a noticeable improvement in the Tees area. These machines might have continued this work but for events elsewhere which led to the creation of the Independent Force. On October 2nd, 1917, the four bombers were transferred to Manston, where they formed the nucleus of a new R.N.A.S. unit, originally known as "A" Squadron but later designated No. 16 Squadron, R.N.A.S. This squadron was intended to carry out independent strategic bombing in co-operation with R.F.C. squadrons against industrial centres in the south of Germany.

Farther afield, an 0/100 of the R.N.A.S. was used in operations in the Aegean. In July 1917 the R.N.A.S. on Mudros began a bombing offensive, one of the principal objectives of which was Constantinople; so with that end in view a single Handley Page was flown 2,000 miles from England to Mudros *via* Paris, Rome and the Balkans. This flight in itself was something of an achievement, and the crew who accomplished it were Sqn. Cdr. K. S. Savory,

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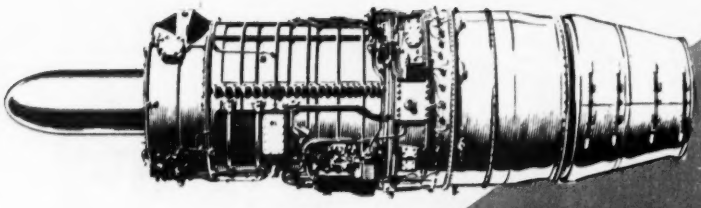

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The first attempts to bomb Constantinople were made on July 3rd and 8th, 1917, but on both occasions adverse winds forced the O/100 to return when it reached the Sea of Marmara. On July 9th the target was reached. Sqn. Cdr. Savory took off from Mudros at 8.47 p.m. and was over Constantinople just before midnight. The enemy was taken completely by surprise, and the Handley Page cruised over the target for 35 minutes at less than 1,000ft. Eight 112 lb bombs were dropped on the German cruiser *Goeben* which was lying in Stenia Bay; two more were dropped on the S.S. *General*, and the last two were aimed at the Turkish War Office. The O/100 reached Mudros safely at 3.40 a.m.

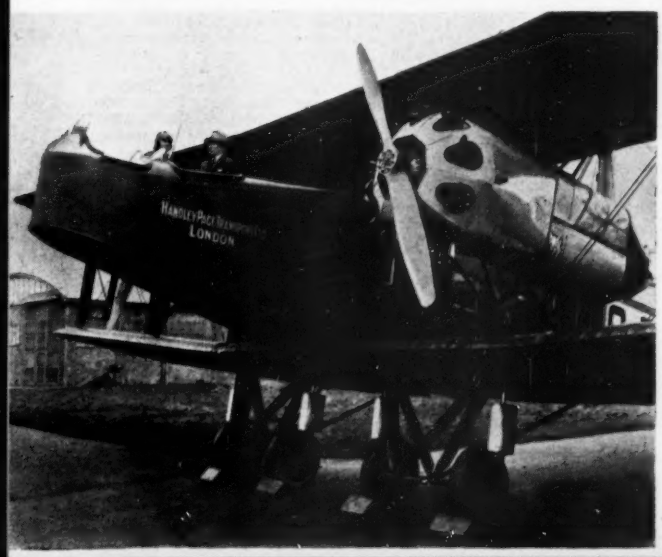
This Handley Page survived until the end of September 1917, and was employed on anti-submarine patrols in addition to making attacks on such places as Panderma and Adrianople. On September 30th, 1917, F/L. J. Alcock took off in the machine with the railway stations at Constantinople and Haidar Pasha as his objectives, but one of the engines failed an hour and a half out from Mudros and Alcock was compelled to turn back. He was unable to maintain height and had to ditch in the Gulf of Xeros. The O/100 floated for about two hours, but the crew's Verey lights went unnoticed and they had to make an hour's swim to land. They ultimately reached Constantinople, but as prisoners of the Turks. Alcock survived the war to make the first direct Transatlantic flight with Arthur Whitten Brown on June 14th-15th, 1919, but was fatally injured on December 18th, 1919, whilst attempting a forced landing in mist near Rouen.

Meanwhile, development of the Handley Page design proceeded at home, much of the work being done by F/L. (later Air Marshal Sir) John Babington. By September 1917 the machine had been modified, principally by the removal of the fuel tanks from the rear of the engine nacelles into the fuselage. Two large cylindrical tanks, each of 130 gallons capacity, were mounted transversely immediately above the bomb bay, and two 14-gallon gravity tanks were installed in the upper centre-section in front of the main spar and directly above the fuselage. Fuel was forced up to the gravity tanks by two wind-driven pumps from which the carburettors were also fed direct. A hand-pump was provided to enable the engines to be started, and the gravity tanks ensured a continuous fuel supply in the absence of sufficient slipstream to drive the wind pumps. The engines could be started by compressed air, which was stored in bottles in the fuselage: alternatively, a manually operated crank handle was used, turned by a mechanic who had to stand on the lower wing to do so. The oil tanks were mounted in the nacelles immediately behind the engine.

By the transfer of the fuel tanks to the fuselage the nacelles were shortened sufficiently to enable an ordinary interplane strut to be fitted between the rear spars of that wing bay instead of the diamond configuration of the engine-supporting struts of the original O/100. The first aircraft to embody this modification was No. 3138, and the new designation O/400 was applied to subsequent machines which had the revised fuel system; otherwise the design was little changed. In the tail unit the central fin was moved back to a position directly under the upper tailplane.

Various engines were fitted, including Sunbeam Cossacks, but perhaps the most interesting experimental machine was No. 3117, which had four 200 h.p. Hispano-Suiza engines arranged in two tandem pairs. This installation was made at Farnborough under the direction of Major Bishop, but was not particularly successful, for at that time the behaviour of an airscrew working in the slipstream of another was not understood. However, some valuable data were collected and utilised to good purpose in the design of the later Handley Page V/1500. Contract No. A.S. 20629, dated July 29th, 1917, was for six machines (numbered B.9446 to B.9451) which were to have two 200 h.p. Sunbeam Arab engines. History does not record the career of these machines, but the Arab was notoriously unreliable and given to excessive vibration. Even if both engines were on their best behaviour an O/400 fitted with them must have been badly underpowered.

In the cockpit of this 1/10—a post-war, ten-seat civil conversion of the O/400—are Capt. P. Olley (helmeted), at that time a Handley Page Transport pilot, and Mr. Arthur Suddes of the Bristol Aeroplane Co.



The best-known power-plant of the O/400 was two 375 h.p. Rolls-Royce Eagle VIIIs, but Eagle IVs were used on some machines, and other alternatives were the Sunbeam Maori, Fiat A.12bis and Liberty engines. The Liberty was, of course, fitted to all American-built O/400s. Rolls-Royce Eagles outnumbered all other types of engine as the O/400's power installation. Of a group of 122 Handley Pages delivered to the R.A.F. up to November 11th, 1918, no fewer than 113 had Eagles.

The experiments which were carried out in the course of development included modifications to the ailerons and undercarriage. The complexity of the latter obviously caused a considerable amount of drag, but simpler forms of undercarriage proved to be less satisfactory when tried and the original structure was retained. In 1918 experiments were carried out with ailerons which were flush with the wing-tips, and obtained their balance by virtue of setback hinges in place of the characteristic horn balances of the standard O/400.

Despite the successes of the handful of O/100s flown by the R.N.A.S. the Air Board was hard to convince of the value of night bombing. Its military members were of the opinion that night-bombing was less accurate than day bombing, and said that the R.F.C. preferred speed to weight-carrying ability in their bombers. At the meeting of the Air Board held on July 23rd, 1917, it was decided that all orders for experimental heavy bombers should be left in abeyance, but a week later Sir William Weir brought the subject up again after the Controller of the Technical Department had expressed the strongest disapproval of the Board's action. Reluctantly, the Board ordered 100 Handley Pages for night bombing, and placed orders for three experimental machines with Handley Page Ltd. and Vickers Ltd.; these materialised as the V/1500 and Vimy respectively.

Some members of the Air Board who remained sceptical of the capabilities of night bombers were considerably surprised by information placed before them by Captain V. Vyvyan, R.N. He had taken the trouble to collect reports from the R.N.A.S. 5th Wing which left no doubt as to the effectiveness of night bombing. The reports showed that, generally speaking, night bombing was then more accurate than day bombing, and that casualtes among the Handley Pages were much lower than those of the D.H.4s.

Any further misgivings or objections were effectively dispelled by the enemy, however, for systematic night bombing attacks on England began on September 2nd, 1917. The Air Board hastened to order 200 more Handley Pages on September 6th, and added yet another 100 when they received Haig's letter of September 10th in which he asked that at least 25 per cent of any additional bombing squadrons sent to France should be equipped for night work.

At the beginning of October 1917 Major-General Trenchard was instructed to attack objectives in Germany which could be reached from Nancy. The 41st Wing, commanded by Lt.-Col. C. L. N. Newall, was formed at once on October 11th by withdrawing Squadrons No. 55 (D.H.4), 100 (F.E.2b) and No. 61 (Naval) with its Handley Pages. As already related, No. 16 (Naval) was originally known as "A" Squadron, and was formed from the nucleus of four Handley Pages originally sent to Redcar from Coudekerque: the squadron flew to the 41st Wing's aerodrome at Ochey in mid-October under the leadership of the indefatigable Sqn. Cdr. K. S. Savory. This was the beginning of the Independent Force.

No. 16 (Naval) Squadron undertook many raids between October 24th and the Armistice, its objectives being numerous and various. Saarbrücken, Mannheim, Thionville, Conflans, Juniville and Coblenz were only a few of the places which were attacked. The number of Handley Pages used in each individual raid was never large, and it was not until the autumn of 1918, when No. 216 (as No. 16 Naval had then become) was augmented by the O/400s of Squadrons No. 97, 100, 115 and 215, that appreciable numbers of the big bombers were used. The reports of the early sorties of No. 16 (Naval) indicate that usually only three or four Handley Pages would set out on a raid: engine trouble frequently caused one or more to return to base.

The main burden of strategical night bombing was borne by No. 16 Naval's Handley Pages and No. 100's F.E.2Bs until August 1918, when three more O/400 squadrons arrived in France, to join what on June 6th, 1918, had been officially designated the Independent Force, R.A.F.: the 41st Wing had become the VIII Brigade on February 1st. These new units and their dates of joining the Independent Force were No. 97, August 9th; No. 125, August 19th; and No. 115, August 31st; whilst during the month No. 100 Squadron began to re-equip with O/400s. The largest number of O/400s to take off on any one night was 40: the night was September 14th-15th, 1918, and the objectives were Metz-

HANDLEY PAGE 0/100 and 0/400 . . .

Sablon, Kaiserslautern, Courcelles, Ehrang, Saarbrücken and Frescaty aerodrome. Nine of the 40 had to return with engine trouble, one force-landed in our lines and three failed to return.

Small though these raids may seem in comparison with Bomber Command's massive attacks of the recent war, they were extremely damaging to the morale of the workers in the factories which provided the majority of this first strategic air force's targets. One of the raids which made the deepest impression was carried out by only two 0/400s of No. 215 Squadron on the night of August 25th-26th, 1918, when they attacked the Badische works at Mannheim from a low altitude and added to the havoc of their bombs by skilful use of their Lewis guns. As was fitting, the last raid of the Independent Force was made by No. 216 Squadron: on the night of November 10th-11th, 1918, two of its Handley Pages attacked Metz-Sablon and Frescaty aerodrome.

During the German offensive of March 1918, considerable use was made of the 0/400s to attack the enemy's communications. No. 7 (Naval) and 14 (Naval) Squadrons were diverted to this duty from their allotted task of bombing Bruges. On the night of March 26th, 1918, five machines from each squadron set out to attack Valenciennes, and the seven which reached the objective dropped four 250 lb and seventy-six 112 lb bombs on the packed railway junction: the other three machines attacked other railway stations. These squadrons were augmented for a few weeks by Nos. 100 and 216, which were transferred to Villeseneux on April 1st, 1918, for attacks on enemy railways in the Chalons-sur-Marne area. These units were under French command, but returned to the VIII Brigade on May 9th, after having made six raids in which 11 tons of bombs were dropped on the stations at Juniville, Chaulnes, Roye, Amagne-Lucquy, Mohon and Asfeld.

An 0/400 could carry as many as sixteen 112 lb bombs and there was provision for two more bombs on external racks under the fuselage, but the usual load consisted of twelve 112-pounders. Roughly equivalent weights of heavier bombs were carried, including three 520 lb "light-case" or three 550 lb "heavy-case" bombs. Captain C. H. Darley of No. 214 Squadron made good use of his three 520-pounders on May 28th, 1918, when, gliding in over Bruges with engines silent, he dropped the bombs on the locks there. Towards the end of the war large bombs of 1,650 lb came into use and were delivered to the enemy by the Handley Pages. One of No. 21 Squadron's last recorded exploits of the war was the dropping of one of these bombs on the railway sidings at Melle: it struck an ammunition train and caused enormous damage. The bombs were usually aimed by the nose gunner, who had an H.A.1a bomb sight mounted externally on a bracket in front of his cockpit.

Only one 0/400 was used operationally outside France. In July 1918, Brig-Gen. A. E. Borton and Major A. S. C. Maclaren flew one from England to Palestine, where it was attached to No. 67 Squadron (No. 1 Squadron, Australian Flying Corps). By September, Col. T. E. Lawrence found his activities were greatly impeded by the aerial activity of the enemy around Der'a. The chief difficulty lay in transporting supplies for such fighting aircraft as might be sent to help Lawrence, but this was overcome by using the 0/400 as a transport. Two Bristol Fighters and a D.H.9 were sent to Lawrence's aid, and the 0/400 carried a ton of petrol, oil, supplies and mail. The first landing at Umm-es-Surab, was made by Captain Ross Smith of No. 67 Squadron, and later the 0/400 reverted to its normal rôle by making night attacks on Mafraq and Der'a. On the eve of Allenby's offensive this machine struck a vital blow against the enemy by wrecking the Turkish G.H.Q.'s telegraph and telephone exchange. It was this same 0/400 which later flew from Cairo to Calcutta *via* Damascus, Baghdad and Karachi.

In America production of the 0/400 was undertaken by the Standard Aircraft Corporation, the first American-built machine being delivered in September 1918. The engines were the 350 h.p. Liberty 12-N, and 1,500 0/400s were ordered. Only 107 were delivered, for the remainder were cancelled because of the Armistice. The fate of most of the American-built Handley Pages is obscure: on June 30th, 1919, only four were in commission and a further 20 were stored.

The 0/400's good weight-lifting capacity offered prospects of useful payloads in post-war commercial service, and it was used at home and abroad for passenger and freight transport, either in its original form or as the 0/7, 0/10 or 0/11 with fuel tanks restored to their original position behind the engines, and passenger seats installed in the space thus cleared in the fuselage. Additional windows were fitted along the fuselage sides and the internal bracing was modified by fitting vee-struts in place of the athwartships cross-bracing.

The first semi-commercial 0/400s were the eight which were used by the R.A.F. Communication Wing in 1919 for the transport of mail and passengers between London and Paris during the Peace Conference. Modified to accommodate six passengers, they averaged 3 hr 17 min for the journey, and their best time was 2 hr 26 min. The 0/400 was in at the birth of Civil Aviation in Britain on May 1st, 1919. On that day the official ban on civil flying was lifted, and Lt.-Col. W. Sholto Douglas (now Lord Douglas of Kirtleside) flew an 0/400 with 10 passengers from Cricklewood to Didsbury, Manchester, the distance of 165 miles being covered against a 30 m.p.h. head-wind in 3 hr 40 min. Five days later this machine flew from Manchester to Aberdeen with five passengers and a consignment of newspapers, 315 miles non-stop in 4 hr 25 min. On August 25th, 1919, an 0/400 of Handley Page Transport, Ltd., flew to Paris, and a regular service between Cricklewood and the French capital began on September 2nd. The company's Brussels service was inaugurated on September 24th.

Overseas, at least one 0/7 went to South Africa, where it was used by Handley Page (S.A.) Transport, Ltd. at Capetown, and several Handley Pages went to China in 1920. Air-mail transportation was pioneered in China by these machines, the first experimental flight being made from Tientsin to Peking in May 1920. At least one of the Chinese Handley Pages was used for military purposes against rebels, but it caught fire in the air and was destroyed.

A giant in war, a pioneer of air transport in peace, and above all the distinguished ancestor of an unbroken line of Handley Page heavy bombers and civilian transport machines; such was the 0/400. By virtue of its majestic size it gave rise to a popular generic term which for many years was indiscriminately applied by the layman to all large aeroplanes: "Handley Page" still appears in the Concise Oxford Dictionary as a noun, meaning "Type of large aeroplane." Lawrence's Arabs at Umm-es-Surab admiringly and rightly appraised it when they said, "Indeed, and at last, they have sent us THE aeroplane."

H.P. 0/100 AND 0/400 DATA

Dimensions.—Span (upper), 100ft; span (lower), 70ft; length, 62ft 10½in; height, 22ft; wing area, 1,648 sq ft.

Power plant.—0/100: two 275 h.p. Rolls-Royce; two 275 h.p. Sunbeam Maori; four 200 h.p. Hispano-Suiza (experimental). 0/400: two 275 h.p. Rolls-Royce Eagle II (prototype); two Rolls-Royce Eagle IV; two 375 h.p. Rolls-Royce Eagle VIII; two 200 h.p. Sunbeam Arab (six machines only); two 275 h.p. Sunbeam Maori; two 320 h.p. Sunbeam Cossack; two 300 h.p. Fiat A.12bis; two 350 h.p. Liberty 12-N.

Manufacturers.—Handley Page Ltd., Cricklewood, London: six contracts for 336 0/400 aircraft, serial numbers B.9446-B.9451 (Sunbeam Arab engines), C.3381-C.3480, C.9636-C.9785, D.8301-D.8350, F.3748-F.3767, F.7134-F.7143 (Eagle, Maori or Liberty engines).

Sub-contractors.—The Birmingham Carriage Co., two contracts for 70 aircraft, serial numbers D.5401-D.5450 and F.301-F.320 (Eagles); Clayton and Shuttleworth, Lincoln, one contract for 50 aircraft, serial numbers D.9681-D.9730 (Eagles); The Metropolitan Waggon Co., Birmingham, one contract for 100 aircraft, serial numbers D.4561-D.4660 (Eagle or Liberty engines specified); National Aircraft Factory No. 1, one contract for 100 aircraft, serial numbers F.5349-F.5448 (Liberty engines specified); Royal Aircraft Factory, Farnborough, two contracts for 24 aircraft, serial numbers C.3487-C.3498 and B.8802-B.8813 (Eagles). There were other, later, 0/400s with serial numbers in the J range.

Production and Allocation.—Forty 0/100s were built. Approximately 700 0/400s were ordered, and about 400 were built before the Armistice. During 1918, 71 0/400s were delivered to the Expeditionary Force, 103 to the Independent Force, 18 to the 5th Group, 96 to Training Units and two to the Middle East Brigade. On October 31st, 1918, the R.A.F. had 258 0/400s on charge. Of these, 42 were with the Expeditionary Force, 84 were with the squadrons of the Independent Force, two were with the Middle East Brigade, 24 were at Training Units, and 31 were at Aircraft Acceptance Parks and/or contractors. The remainder

Three of the Handley Page Transport fleet at Cricklewood, whence services were flown to Paris, Brussels and Amsterdam. B.E.A.'s present chairman, Lord Douglas, was one of the pilots.

were at Aeroplane Repair Depots or at various aerodromes in the United Kingdom.

Armament.—The o/100 could carry up to 14×112 lb bombs; the o/400's load varied, but could consist of up to 16×112 lb bombs, 8×250 lb bombs, 3×520 lb bombs, 3×550 lb bombs, or one 1,650 lb bomb. There were racks for two additional bombs carried externally under the fuselage. The Type H.A.1A bomb sight was fitted externally at the extreme front of the fuselage. Either one or twin double-yoked 0.303in Lewis machine-guns on Scarff ring-mounting on bow cockpit; upper rear cockpit contained either one Lewis on a rocking-post mounting or, more usually, two Lewis guns, each on an individual bracket at each side of the cockpit. A further Lewis gun was mounted to fire backwards and downwards through a trapdoor in the floor of the fuselage abaft the mainplanes. Experiments were made with installations of two-pounder and six-pounder Davis guns, but proved to be ineffective.

Service Use.—o/100: R.N.A.S. Squadrons No. 7, 7A (later No. 14) and "A" (later No. 16). Training Squadron at Manston. o/400: *Western Front.*—IX Brigade: R.A.F. Squadrons No. 58 (82nd Wing), 207 (54th Wing), and 214 (82nd Wing). VIII Brigade (The Independent Force): R.A.F. Squadrons No. 97, 100, 115, 215 and 216 (all of 83rd Wing). *Palestine.*—One o/400 attached to No 67 Sqn. (No. 1 Sqn., A.F.C.) (40th Army Wing, Palestine). *Training Units.*—No. 1 School of Navigation and Bomb-dropping, Andover. No. 2 School of Navigation and Bomb-dropping, Stonehenge.

Notes on Individual Machines.—No. 1455, first prototype o/100; 1457, o/100; 3116, first o/100 to land at Coudekerque; 3117, o/100 with experimental installation of four 200-h.p. Hispano-Suiza engines in two tandem pairs; 3126, o/100; 3134, o/100 claimed by Germans as brought down in May 1918 (probably one of seven which bombed Mannheim, Thionville and Karthaus on May 21st-22nd, 1918); 3135, o/100 of R.N.A.S. 5th Wing, Coudekerque (having the markings "B 3" on the fuselage), crashed; 3138, o/100 modified to become o/400 prototype; 3141, claimed by Germans as brought down in November, 1917 (Crew: Lts. Linnell and Smith. Probably one of four of Naval A Squadron which took part in the attempted raid of October 30th-31st, 1917); B.8803, claimed by Germans as brought down in September 1918 (crew: Lt. Taylor, Grasbach, Bourton); C.9658, claimed by Germans as brought down in September 1918 (crew: Lt. Dodd (killed), Jeffkins, Jaisburd (?)); C.9662, claimed by Germans as brought down in September 1918; C.9682, claimed by Germans as brought down in September 1918 (crew: Lt. Lapp, Down, Yellerton); C.9689, claimed by Germans as brought down in September 1918; D.8326, o/400 modified in 1919 for use by Communications Wing and named H.M. Air Liner *Silver Star*; F.5414, became G-EAAF; F.5417, became G-EAAW; F.5418, became G-EAAG; J.2251, o/400; J.2257, o/400; J.2262, became o/10 G-EATK.

WEIGHTS AND PERFORMANCES

	o/100	o/400 prototype, No. 3138 (Eagles)		Production o/400 (Eagle VIII)	o/400 (Liberty)
		Without bombs	With 16 x 112 lb bombs		
Weight empty...		8,480 lb	8,480 lb	8,200 lb	7,894 lb
Weight loaded	14,000 lb	12,230 lb	14,022 lb	14,000 lb	14,300 lb
Max. speed at:—					
s.l. ...	95 m.p.h.			97½ m.p.h.	92 m.p.h.
4,000ft ...			86½ m.p.h.		
5,000ft ...		91½ m.p.h.	83½ m.p.h.		90 m.p.h.
6,500ft ...		88½ m.p.h.	79½ m.p.h.	84½ m.p.h.	
8,000ft ...		85 m.p.h.	75 m.p.h.		
10,000ft ...		80 m.p.h.		80 m.p.h.	85 m.p.h.
Climb to:—					
1,000ft ...	2 min 10 sec	2 min 10 sec	2 min 55 sec		
2,000ft ...		4 min 35 sec	6 min 20 sec		
4,000ft ...		10 min 30 sec	14 min 40 sec		
5,000ft ...					12 min
6,000ft ...		18 min	26 min 35 sec		
7,000ft ...			34 min 55 sec		18 min
8,000ft ...		28 min 10 sec	46 min 05 sec		
9,000ft ...		34 min 40 sec			
10,000ft ...		42 min 35 sec		45 min	32 min
Service ceiling...			7,000ft	8,500ft	10,000ft
Endurance ...		8 hr	8 hr	8 hr	

Losses of Independent Force Handley Page Aircraft, June-November 1918: Missing, 18; wrecked, 51.

Analysis by Squadrons of Missing Machines: (period June-November, 1918).—No. 97, three; No. 100, one; No. 115, one; No. 215, ten; No. 216, three. Total, 18.

Costs.—Airframe (less guns, instruments and engines), £6,000; Rolls-Royce Eagle, Mks. II and IV, £1,430 each; Rolls-Royce Eagle VIII, £1,622 10s each; Sunbeam Maori, £1,391 10s each; Fiat A.12bis, £1,617 each; Liberty, £1,215 each.

THE LORDS DISCUSS PRODUCTION (Continued from page 252)

assured the House that there was no complacency on the part of the present Government regarding Naval Aviation.

At this point Lord Mancroft remarked: "Your Lordships may have noticed a highly informative and interesting article in the magazine *Flight* of, I think, February 6th [leading article, "Fighters for the Navy"—ED.], which in itself caused considerable comment in the daily and Sunday papers. I thought I could detect many of the opinions expressed in that article in some of the speeches made this afternoon."

Continuing, Lord Mancroft said that means to improve the position were being constantly and earnestly sought. At the same time he stressed that more and more emphasis was being given by the Admiralty to a knowledge of air matters among senior officers of the Royal Navy. He admitted that co-operation between the Admiralty, Air Ministry, Ministry of Supply, and the industry itself was not perfect, but said the situation was being rapidly and successfully improved. He agreed that there had been perhaps too many changes to individual naval aircraft, and hoped it would soon be possible to say that those difficulties had been fully overcome.

He did not think that the super-priority was likely to have any decisive effect on the production of naval fighter aircraft. For instance, delays on the Sea Hawk had been sufficiently overcome as to suggest that, at this particular stage, super-priority would not greatly accelerate production.

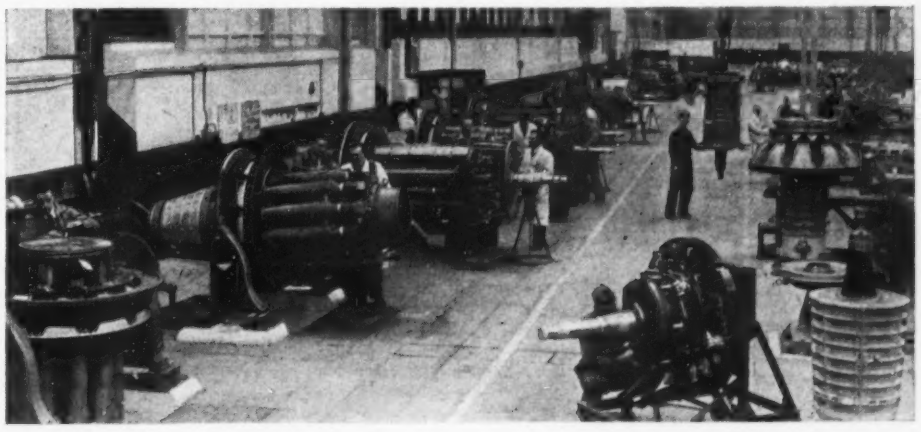
Discussing particular types, he declared that the Attacker, which had attracted "a little unhappy notoriety," was a good aircraft and was giving good service. It was giving satisfaction to the Staff, and to the pilots who flew it. The defects in armament and fuel supply were not major ones, and were not widespread throughout the class of aircraft. The Attacker was, of course, only a stop-gap, and should not be regarded as anything else.

Lord Mancroft went on to announce that the Sea Hawk would come into squadron service "in the immediate future, but a little late." There had been serious production delays, mostly through labour difficulties, but these had now been overcome. The Gannet had, unfortunately, been seriously delayed; but it was a potent anti-submarine weapon which the Staff had every confidence would fill all the tasks allotted to it; and production, with super-priority, was coming along well.

He then made reference to transatlantic services, saying that there was no reason to suppose that the aircraft available for this important traffic, particularly in Coronation year, would be insufficient.

Next he spoke of American C.s of A. for the Comet 3, saying there was "definitely no dog-in-the-manger attitude" by the U.S. on that score. There had recently been close conversations in America on the subject, and it was hoped in the very near future to announce a final and satisfactory result.

Replying to criticisms about the financial situation of the industry, he said there was no case of aircraft manufacturers having their initiative damped, when they could otherwise go into the market, by lack of Government support or backing. Housing, he said, was not at the moment a serious difficulty. In certain specified areas there might be some difficulty, but on the whole the question was not at the moment standing seriously in the way of aircraft production.



NAVAL PRODUCTION: Reference was made last week to the clearance of the Westland Wyvern S.4 for Naval service, and a picture of the aircraft appeared on page 239. These powerful strike aircraft have Python turbo-props, examples of which are here seen during assembly in the Armstrong Siddeley shops. The airscrew is the work of Rotol, and early problems with the control of the Python, particularly for deck landing, were solved a few months ago. The makers now report a favourable reception from Boscombe pilots.

KEEPING ABREAST

New Test and Ancillary Equipment by Rollason Aerocessories

MUCH of the success of any concern that develops test and ancillary equipment for aircraft operators, is dependent upon that firm's practical—as opposed to academic—knowledge of aviation requirements. That the name of Rollason has been known for so long in the industry can without doubt be taken as a guarantee that several new items of equipment produced by Rollason Aerocessories, Ltd., Croydon Airport, will do what they are intended to do, and with maximum efficiency.

Three of the items are illustrated below. The first is a calibrating and test-rig for cabin pressurization controllers. In general, it comprises (*a*) A large pressure-chamber and sealing bulkhead, which together make possible the simulation of a pressurized cabin; (*b*) A smaller chamber, concealed under the bench-top, to simulate altitude conditions; (*c*) A metal bench, the top of which has sunken rails on which travels the wheeled cabin chamber; (*d*) A box-type instrument panel in which are housed the control valves and the altitude-indicating instruments. Suction can be applied either by a motor-driven pump or by means of the service usually available in works of the kind that would use this equipment.

For calibrating or testing controllers, the cabin chamber is retracted so that the controller can be mounted on an outrigger support which can be adapted to suit various types of controllers. The cabin chamber is then moved forward until its vee flange contacts a resilient sealing ring fitted to the bulkhead, whereupon three quick-action cam clamps give an airtight seal.

The operator then adjusts some or all of nine valves to obtain the conditions required for a specified test. Three indicating instruments show (1) cabin altitude, (2) atmospheric altitude and (3) the control by the pressure/suction capsules which form an essential part of pressure controllers. An electrical circuit and four indicating lamps on the panel show the correct operation of contacts fitted in the controller. Union connectors fitted to the bulkhead establish connections between the cabin and altitude chamber and between the test panel and the chambers or the controller on test. All pipe lines are of metal construction.

Turning now to test equipment for mass-flow controllers, it should first be remarked that such devices are normally fitted with delicate operating switches governed by a low-pressure air differential acting on each side of a diaphragm. Rollasons remark that the only foolproof method of calibrating or testing air differentials equal only to an inch or so of water is a very sensitive manometer, as no mechanical instrument could provide a suitable test. In their test equipment, the manometer is provided with five scales which are operated by a thumbwheel and located by a ball catch. The manometer cistern, which is of all-plastic construction, is provided with mechanism controlled by a thumbwheel for adjusting the zero of the manometer before a test. The rotatable scale is marked with minimum and maximum conditions for altitudes at which tests are carried out, and altitude is registered on the indicating instrument fitted to the centre of the panel. An "absolute type" pressure gauge, reading −30 in +20 in Hg, indicates higher pressure, and is of particular use for leak-testing on each side of the controller diaphragm.

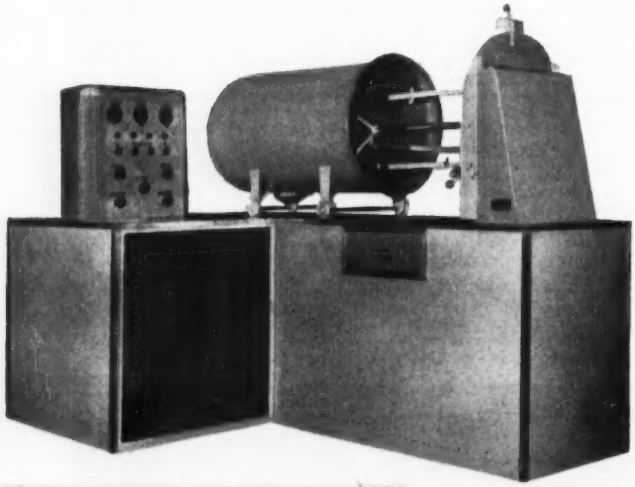
Seven valves control pressure or suction, which is applied *via* connectors situated on the right of the panel. Special bubble-type mercury safety-valves prevent a differential in excess of 1 in Hg. during tests, and mercury traps are incorporated as a final precautionary measure.

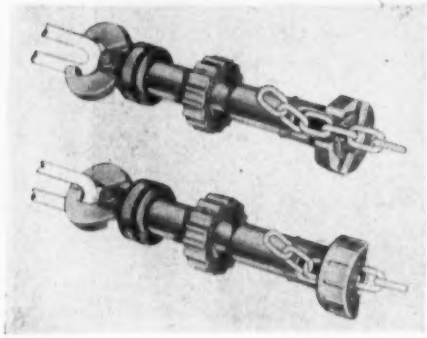
Input of D.C. low-voltage current is governed by a potentiometer and read on a voltmeter. Current to the controller under test passes through a differing type of electric connector, and two sets of suitably labelled terminals are also provided. The electrical circuit includes red and green lamps which indicate precisely the function of the contacts incorporated in the controller. The test panel is fitted with adjustable feet and has a bubble-type level.

Further recent developments in test equipment, now in production, include temperature-checking equipment for aircraft temperature-operated instruments, and there is also a range of super-sensitive control valves.

A practical detail fitting which should have a number of useful aircraft applications is the quick-release coupling illustrated below; it is particularly suitable for lashing heavy freight. Combined are three elements, (*a*) holding jaws which have a quick-action cam-operated release or lock; (*b*) a turnbuckle type of hand-operated tension device; and (*c*) a housing and handle for quick release or securing of the lashing chain. Comparatively light in weight, the couplings are made in two sizes, to withstand loads of 5,000 lb and 10,000 lb respectively.

Yet another newly introduced item is a trolley equipped for the de-icing of aircraft that have landed in an iced condition or have accumulated ice while on the ground. A petrol-engine-driven pump supplies de-icing fluid, from a large-capacity tank, through hoses to a variety of lances designed to apply the medium effectively. Included also is an extending access-tower, while the trolley itself, with the equipment removed, can be used for a number of other ground-service purposes.

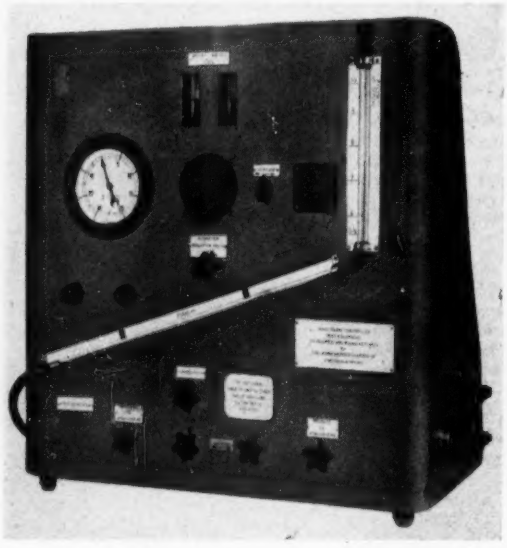




(Above) The test-rig for pressurization controllers. It occupies a floor-space of 7 ft. 6 in by 5 ft.

(Right) Test-equipment for mass-flow controllers. Both these items have a hammered grey finish of pleasing appearance.

(Left) Quick-release freight-chain coupling in unlocked and locked positions.



The Vickers Viscount, recently flown across the Atlantic, was powered by four standard Rolls-Royce Dart airscrew-turbines, with turbine rotor blades of Nimonic 80A.

The VISCOUNT

adds to its laurels

NIMONIC ALLOYS...

are the standard materials for the rotor blades in *every* British aircraft gas turbine.

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the way ahead

BEA BRINGS DOWN THE PRICES

BEA's aim has always been to provide popular priced air travel for all who care to enjoy it. Already you can reach Le Bourget in less than two hours for £11.14.0 return (and £9.15.0 return if you fly by night), and now this winter you can fly from London to Glasgow or Edinburgh for £8 return; Belfast £10 return, Isle of Man £8.10.0 return, Channel Isles £7.0.0 return, (Glasgow to Belfast £4.0.0 return, Southampton to Channel Isles £5.0.0 return). All these fares are from airport to airport. For an increasingly air-conscious world the future has never looked brighter—BEA is looking ahead.

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BRITISH EUROPEAN AIRWAYS

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Air Met.

THE loss of the Dakota *Saint Kevin* has given new vigour to the study of air currents over mountain regions, and I must give credit to *Flight* for publishing such detailed and valuable articles on these phenomena.

The fact that other meteorological phenomena have been the cause of recent disasters on land suggests, once again, the great need for the return of the B.B.C. "Air Met." broadcasts.

The normal forecasts serve their purpose well, but thousands of people, each with a slight knowledge of meteorology, would listen to the frequent "Air Met." broadcasts and could be of great help in spreading news of any future storms.

Sudbury, Suffolk. L. H. MAXIM.

"Ultra-Light Possibilities"

COMPARISONS have been made, in recent correspondence, with the motorist and motor cyclist, and it has been suggested that a road vehicle is more dangerous than an aircraft; but mechanical failure on the road often does not result in an accident, as the driver can pull in to the roadside without hitting anything. Most road accidents are due to "pilot error."

Mechanical reliability in an ultra-light aircraft, although the machine flies slowly, and can land in small spaces, is nevertheless most important. Many of the cars whose owners are to be seen peering beneath the bonnet or lying under the chassis show signs of rust and lack of proper care; but these vehicles are used for convenience; the enthusiast learns all he can of his car, treats it accordingly, and consequently is less liable to, and can often foresee the possibility of, a breakdown.

The pilot who would own his own aeroplane is an enthusiast and, like his equivalent on the road, will learn what he can of his machine, and will be able to keep a constant check on it which should result in a standard of airworthiness as high as, and perhaps higher than, that achieved by periodic checks by an authorized person, when any rough treatment might be given to the aircraft in the interval.

A simple examination which the prospective "ultra-light" owner could take would show if he knew what to look for, and when skilled attention was necessary; a pass in this should allow him to operate his aeroplane without the costly inspections required by present regulations.

Cambridge. PEDANTICA.

Television Authenticity

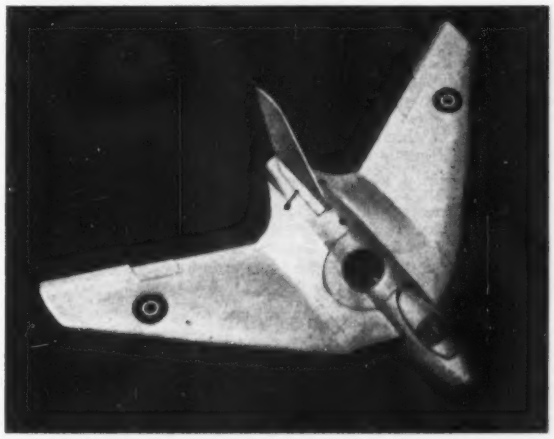
I WAS surprised to see that *Flight's* critic who has been reviewing the B.B.C. television war film made no mention of the fact that the shots in Episode 9, "The Magnetic North," showing the straffing of a lightship and the survivors in a lifeboat, were not genuine.

The aircraft doing the straffing was actually a Beaufighter, and the shots shown were taken from a British film made during the war, depicting German attacks on light vessels off the east coast.

It seems a great pity that such pictures should have been allowed to be included in a series which has been claimed to be authentic.

Crawley, Sussex. J. AUSTEN.

The D.H.9As referred to (right) by Mr. J. Goodyear.



A D.H. 108 model powered by a ducted fan (see letter below).

Ducted-fan Models

ENCLOSED is a photograph of a model aircraft which I believe to be the first successful free-flight model to be propelled by a centrifugal-flow fan. It is a model D.H.108 built by J. Coatsworth of South Croydon, Surrey, who in pioneering this development becomes the modelling counterpart of Sir Frank Whittle! Scale jets driven by straight-through axial-flow fans have been flying in this country now for something over a year.

Span of the D.H.108 is 24in, and total weight 8 oz. Static thrust is just under 3 oz, the fan being direct driven by a ½ c.c. diesel engine lying on its back in the fuselage. A divided volute is used, taking most of the air to the tailpipe, but a proportion is ducted away to cool the engine and is ejected under the fuselage. One advantage of this type of fan is its, to date, complete absence from failures. The first flight of the model illustrated took place on September 27th last, since when other models have been built and flown on the same principle—Hawker P.1052, P.1081 and a Cougar of 18in span.

Tadworth, Surrey. M. M. GATES.

Royal Bristol Fighter

THE reading of the many interesting letters that have recently appeared in your columns induce me to forward to you a newspaper cutting illustrating what was probably the most expensive and beautifully finished Bristol Fighter that was ever made. This aircraft was prepared by the Aircraft Disposal Co., Croydon Airport, for presentation to the Queen of the Belgians, and I had the honour of flying it to Brussels on January 17th, 1922. The flying time, from take-off at Croydon to landing at Evere, Brussels, was 84 minutes, which is good going even by present-day airline standards.

Croydon Airport. A. F. MUIR.
Director, Muir and Adie, Ltd.

[The illustration mentioned is not clear enough for publication, but a reference in *Flight* at the time describes the aircraft as being "furnished in aluminium throughout, which makes it look very light and graceful."—ED.]

By the Pyramids

THE first landing ever performed by an aeroplane at the foot of the Pyramids surely cannot be that of the glider belonging to the Egyptian Army, as pictured in your issue of January 9th, 1953.

During my service with No. 47 Squadron at Helwan, our D.H.9As made many landings by the Pyramids, as the enclosed photograph, taken in 1925, will show.

Years earlier, of course, pilots stationed in Egypt during the 1914-18 war had made landings by the Pyramids.

Hounslow, Middlesex. J. GOODYEAR.
Assist. Aerodrome Manager, London Airport

THE INDUSTRY

Apprentices at Acton—

THE eighth annual presentation of indentures and awards to apprentices of D. Napier and Son, Ltd., took place at Acton recently. This company, like many others in the aircraft industry, is able to show extremely good progress in the training of apprentices, reflected in the fact that the total apprentice strength has been doubled during a recent period of twelve months. About fifteen months ago, Napiers reorganized their training school, in order to permit an increase in apprentice strength to 180 by the end of 1952; in fact, last year was completed with 265 apprentices of all grades, of which 36 were graduates, 47 students, and 182 craft apprentices. Equally assuring is the fact that wastage of apprentices is now small.

The Company's Trophy was awarded to R. L. Allan and the Foremen's Trophy to C. H. Tucker. Certificates of merit went to these two and also to J. M. Kent and M. R. Eden (student apprentices) and R. Hardy, F. C. Groom, E. G. Culver and M. C. R. Brown (trade apprentices). Merit awards totalling £439 in value were given to 82 apprentices.

—and in the Isle of Wight

FROM the Isle of Wight we learn that the Saunders-Roe training school at Osborne also had a very successful year. Fifty-six students of the school entered for various examinations during 1952, 35 of whom passed. Especially noteworthy results were achieved by D. Fletcher (S.B.A.C. scholarship to Cranfield), R. J. Arnold and N. T. Green (industrial scholarship to University College, Southampton), P. Amer (B.Sc., Engineering), and B. A. Kerry (Intermediate B.Sc., Engineering).

A Williamson Celebration

SOME 250 members and guests of the Williamson Manufacturing Co., Ltd., attended the firm's 47th annual dinner, held in London on February 13th. Mr. Colin Williamson, the chairman of the company—who is on a business visit to Australia—sent to the assembled guests a recorded greeting, which was played back over the loud-speaker system and almost gave the impression of his presence at the party.

In a brief speech, Mr. John Odle, joint managing director, reviewed the company's progress. In spite of the large amount of Government work which they had in hand, he said, it had not been necessary to turn away a single civil order. Much of the credit must go to Mr. G. L. Chapman for getting the new Reading factory going so well, and—with the support of Mr. E. W. Sparkes and the rest of the staff—increasing production at Willesden. The firm had heavy responsibilities in the production of new designs of cameras for the R.A.F.

Power to the Industrial Elbow

RECENTLY demonstrated to officials of the Admiralty, the Air Ministry and the Ministry of Supply were three new tools in the range of torque-control appliances made by the Acratork Engineering Co., Ltd., Cory's Buildings, Cardiff. The three were an hydraulic torque generator for torque loads up to 2,000 lb ft; a large version of the standard Acratork spanner for loads of up to 500 lb ft; and a miniature torque-spanner for loads of up to 36 lb in.

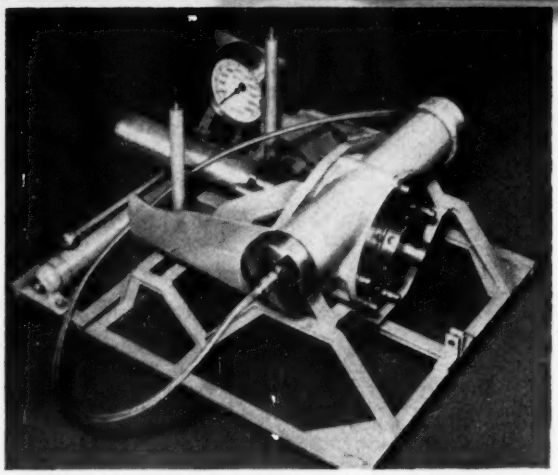
The hydraulic torque-generator demonstrated was a prototype developed initially for the accurately controlled tightening of airscrew hub nuts, but the production tool will be adaptable to many other applications where torque loads of up to 2,000 lb ft are required.

The basic unit consists of a hydraulic cylinder, to the piston of which is attached a chain; the other extremity of the chain is wrapped round a sprocket splined to the operating shaft, one end of which carries the operating square for engagement with the hub nuts. When oil pressure is applied by means of a hand-operated pump, the piston is forced along the cylinder and the shaft is revolved through the medium of the chain and sprocket.

A pressure gauge mounted on the pump unit gives a direct reading, in lb ft, of the actual torque load transmitted to the nut. The ratio between piston area and sprocket diameter is such that the gauge reading also represents lb/sq in on the piston surface. This, of course, means that any pressure gauge of the correct range and accuracy may be used, in the event of the one supplied with the hydraulic generator being damaged. This fact also permits the checking of the gauge on a dead-weight tester.

Mounted on the shaft behind a freely rotating pilot sleeve is a clutch designed to engage the airscrew hub nut, and attached to the body of the cylinder is a jaw member which holds the unit in position on the hub. By the use of suitably designed jaw members, the unit is readily adaptable to other uses.

Torque can be reversed by removing four nuts and a locknut; the cylinder body can then be reassembled in reverse on to the torque reactor, the shaft reinserted on the opposite side, and the nuts replaced. After each application of the generator, the piston is returned to zero by means of a tommy-bar inserted at the rear end of the shaft. It is stated that the complete operation of applying the desired load to one airscrew nut can be carried out by two fitters in about five minutes.



The prototype Acratork hub-nut tool described on this page.

The prototype illustrated was designed to operate with a separate pump, but in production it is intended to mount the pump directly on to the cylinder to form one compact unit.

The second new tool, the 500 lb ft spanner, follows the same design as the existing range of Acratork hand spanners, but the entire construction has been scaled up to take the increased load without distortion or undue stress on the working parts. Development is proceeding with a view to increasing the power of the spanner to 1,000 lb ft. Overall length of the tool is 4ft, and provision is made for the insertion of a tube into the handle to give added leverage when necessary for the higher torque loads.

The miniature spanner is designed for such duties as repetition work on assembly lines in light industry. Although it is designed on the same cam-operated principle of the standard Acratork spanners, it differs in so far as it has a flat cam and, as the cam and spring-housing form the handle, can be operated conveniently in a confined space. The manufacturers claim that the miniature model, like their other torque spanners, cannot be overloaded; it therefore retains its accuracy for long periods of continuous operation within the recommended torque range of up to 36 lb in.

IN BRIEF

NOW under training in the Fairey factories are two Commonwealth students who have been awarded scholarships: P. B. Church, from Canada, here under the Athlone Fellowship scheme, and Ian Buchan, from Australia, who has begun two years' training under the F.B.I. Overseas Scholarship scheme.

* * *

Applications for 1953 Mond Nickel Fellowships are now invited. Details of the awards, which enable successful applicants —not necessarily students of metallurgy—to receive industrial training, are obtainable from The Secretary, Mond Nickel Fellowships Committee, 4, Grosvenor Gardens, London, S.W.1.

* * *

Specialloid, Ltd., and the Aero Piston Ring Co., Ltd., announce that Mr. Peter B. Higgins, A.C.A., A.M.I. Prod. E., M.Inst.M., has been appointed to the boards of both companies. Mr. R. H. Hainsworth, director and general manager, is appointed managing director of Specialloid, Ltd., and Mr. T. O. Hunt, chief designer and technical manager, becomes a technical director of that company.

* * *

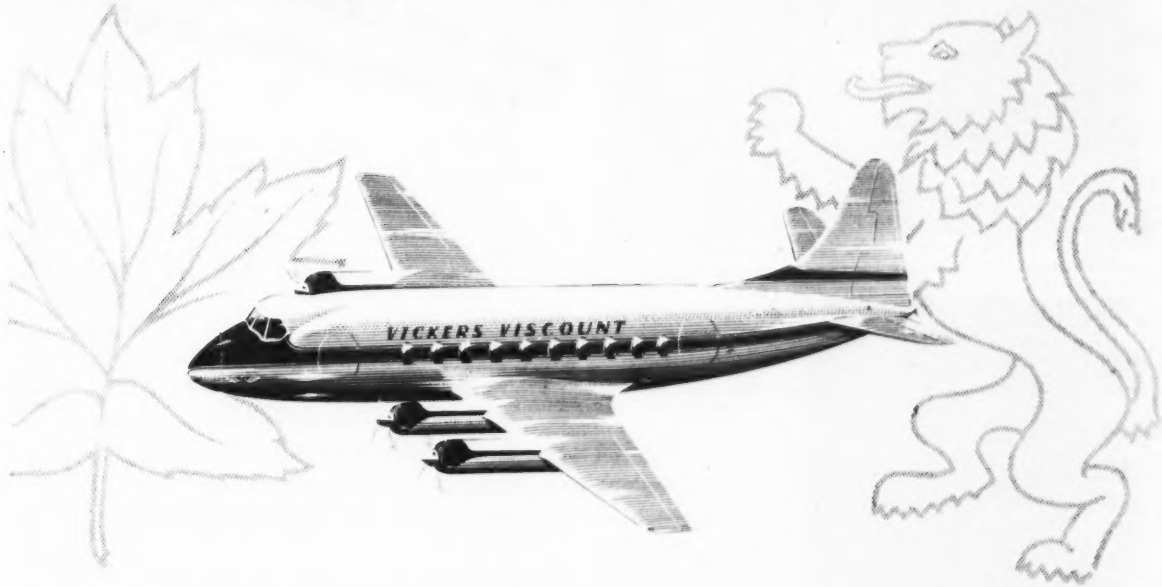
David Brown Tractors, Ltd., are at present executing an R.C.A.F. order for a fleet of aircraft tractors; some are going to Canada and others will be used by the R.C.A.F. in this country. The tractors, which (with their 7,000lb drawbar pull) can handle the largest aircraft at present in service, have a six-position towing hitch at the rear and a single hitch at the front, and there is also a 15,000lb line winch.

* * *

In our issue of February 13th there appeared a note on the project for the erection of a wind-driven generator for the British Electricity Authority. It should be added that Enfield Cables, Ltd., did not only supply the cables: their engineers had for some time past been studying the possibilities of wind power, and they were, in fact, responsible for the whole conception of the machine. The aircraft firms mentioned were the principal sub-contractors, and also contributed valuable suggestions.

BRITAIN'S LEAD IN THE SKIES

First Jet Airliner to Cross the Atlantic



the VICKERS VISCOUNT

flown by G. R. (Jock) Bryce, Chief Test Pilot, Vickers-Armstrongs, Weybridge

was serviced by

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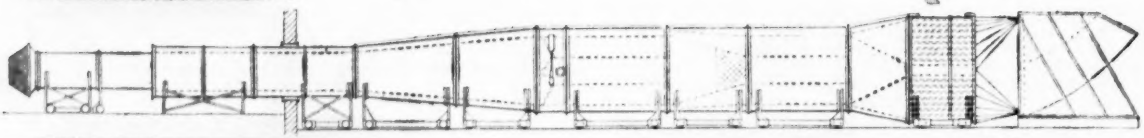
and used

ESSO AVIATION TURBO OIL 35

ESSO PETROLEUM COMPANY, LIMITED, 36 QUEEN ANNE'S GATE, LONDON S.W.1.

NO DECIBELS IN DREAMLAND



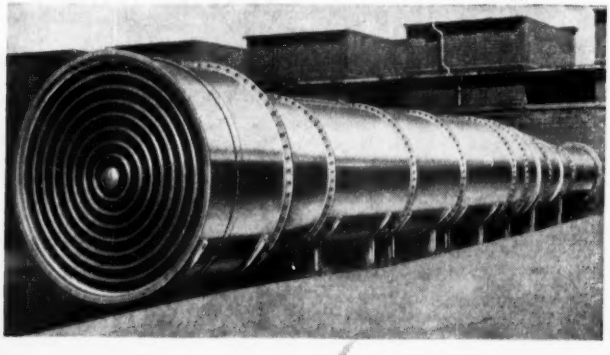
THE

CULLUM DETUNER

As this child sleeps, who would guess that not so far away a new jet engine is roaring on its test bed? It disturbs no-one; for a Cullum Detuner mutes its shattering whine to a gentle rumble.

Super-priority defence production often demands all-night engine testing. And Cullum Detuners (already in regular use by Rolls-Royce, de Havilland, Armstrong Siddeley, the R.A.F. and Admiralty) are helping to make it practicable.

Photograph by courtesy of the de Havilland Engine Company Limited.



DETUNERS LTD

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Efficient offices have Acoustic Tile ceilings by Horace W. Cullum & Co., Ltd.

A FRENCH COMPOUND ENGINE

Characteristics of the S.N.E.C.M.A.-Bertin Design

EVEN a superficial study of thermodynamics cannot fail to show the advantages that can be realized by using a compound power plant. In classical steam reciprocating engines the compounding was achieved by expanding the steam through a series of increasingly larger cylinders. A more recent development is the combination of an internal combustion piston-engine with a gas turbine using the exhaust of the former to drive the latter.

It should be noted at this point that the true compound engine employs both its constituent parts to provide power for the main output shaft; as a consequence, it follows that turbo-supercharged engines cannot be considered as compound units. Examples of true compound aero-engines are the Wright Turbo-Compound and the Napier Nomad, both of which are extremely fine engineering specimens. In France, the Arsenal 12K was developed from the original Arsenal 12H which was, in turn, the Junkers Jumo 213 built in France during the war. This inverted-vee 12-cylinder petrol-injection engine was modified by leading the exhaust from each cylinder-block through a large turbine which drove the crankshaft through elastic couplings and a gearbox.

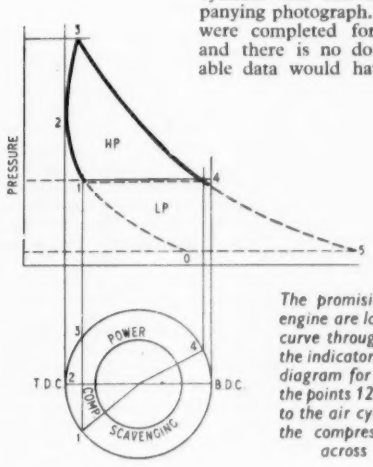
Further details have been published in *Aviation Magazine* of a promising power unit which has been under development in France since 1946. Very strongly reminiscent of the Napier Nomad, the engine has been developed largely through the efforts of Mr. Bertin, who has been working in co-operation with the nationalized engine group of S.N.E.C.M.A. since the end of 1946.

The reciprocating part of the engine consists of a six-cylinder horizontally-opposed unit employing sleeve valves A two-stroke compression-ignition cycle has been adopted (as in the Nomad), the final fuel feed being through high-pressure injectors. The exhaust is expanded through turbines, and the energy thus extracted is put to good account in supercharging the intake air and also in providing high-pressure air for scavenging purposes. The compression pressure has been selected just below the point at which detonation would take place; as will be seen from the data given below, the boost pressures possible are very high.

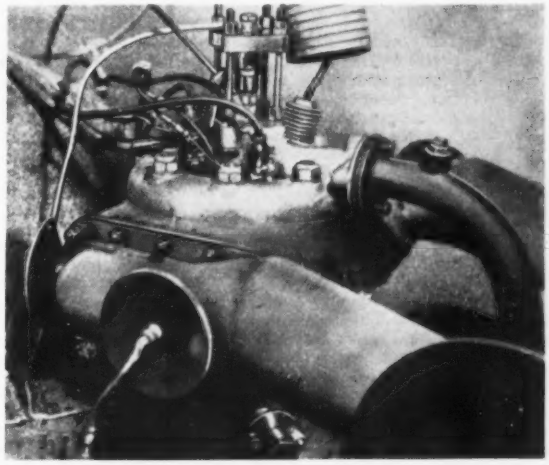
The accompanying indicator diagram shows the manner in which the cylinder pressure falls rapidly as the piston descends, so that, when the exhaust ports open, the cylinder pressure is of the same order as that of the scavenge air. Accordingly, Mr. Bertin states that scavenging can commence immediately the inlet and exhaust ports are opened, and a further gain in efficiency results from the fact that there is no pressure discontinuity when the valve ports are opened. The high scavenge pressure also prevents blow-back of the burnt gasses through the inlet valve.

The energy available in the high-temperature, high-pressure exhaust is greater than could conveniently be utilized in driving the compressor. Energy recuperation, in fact, was originally of the order of : piston engine plus 2; turbine plus 2; compressor minus 1. As a result the turbine/compressor assembly was geared to the airscrew shaft, so producing an energy recovery distribution of : piston engine plus 2; surplus energy from piston engine plus 1; and turbine/compressor unit plus 3.

The arrangement was first tested by M. Bertin with a single-cylinder test bed shown in the accompanying photograph. Later, design studies were completed for the flat-six engine, and there is no doubt that much valuable data would have accrued from the testing of this unit. Unfortunately, the French government refused to sponsor any further development after April, 1950, and work on the project has now ceased. It was originally intended that a 36-cylinder aero-engine should eventually be produced and M. Bertin has publicly deplored the action of the French government in abandoning the work. In fact, he went so far as to say that, were there in France a body at all similar to the British Ministry of Supply, the French aircraft industry would not lack the essential engines which it now needs so badly.



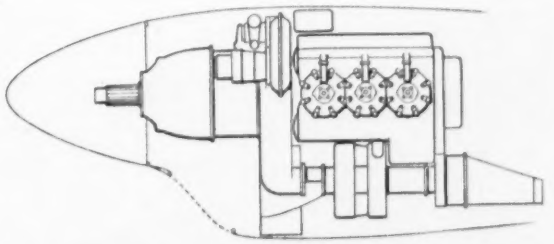
The promising potentialities of the engine are largely due to the smooth curve through the points 1 and 4 in the indicator diagram above. The PV diagram for the cylinder is given by the points 12341; points 01450 refer to the air cycle as it passes through the compressor (01) and expands across the turbine (45).



The single-cylinder test-rig, which was the only unit actually built by the S.N.E.C.M.A group. The massive holding-down bolts on the cylinder head are indicative of the high boost and combustion pressures employed.

Characteristics of Single-cylinder Engine : Bore, 5⅞in; stroke, 6¼in; swept volume, 168 cu in (2.76 litres); maximum power (since slightly improved), 170 h.p. at 2,700 r.p.m.; max. cont. power, 110 h.p.; cruising power, 90 h.p.; specific consumption, 0.44 to 0.48 lb/h.p./hr.

Characteristics of Six-cylinder Engine (based on the single-cylinder results): Take-off horse-power, 1,220 (310 from turbine, 910 from pistons); boost pressure, 56 lb/sq in. Cruising power, 558 h.p. (turbine 158, pistons 400) at 1,900 r.p.m.; boost pressure, 45.5 lb/sq in.; specific consumption, 0.332 lb/h.p./hr.



The six-cylinder S.N.E.C.M.A.-Bertin unit would have cowled quite neatly, with the turbine/compressor beneath the crankcase. The weight of the engine was estimated as 1,875 lb.

U.S. FIRM'S CANADIAN SUBSIDIARY

AN American firm, the Cook Electric Company of Chicago, has completed arrangements to establish a subsidiary for the manufacture of aircraft components in Canada. Under the title of Canadian Diaphlex, Ltd., and with a new factory in Toronto, the company will manufacture such products as pressure-switches, hermetically sealed relays and time-delays, control assemblies and ice-detection equipment.

The parent company is a large supplier of components to the U.S.A.F. and other Services in the United States.

CIVIL AVIATION

TOP AND SIDES of this Martin 4-0-4 are finished in the smart white livery of Trans World Airlines. Originally introduced by B.O.A.C., the white cabin-top is now employed by most of the world's airlines—partly to reduce interior temperature by reflecting radiant heat and partly for the sake of appearance.

LONDON HELICOPTER SITES SURVEYED

FLYING in a Sikorsky S-51 of B.E.A. last Monday afternoon Mr. John Profumo, Parliamentary Secretary to the M.C.A., and Mr. I. J. Hayward, Leader of the L.C.C., made a survey of possible helicopter landing sites in Central London. The rotorplane, piloted by Capt. J. Thielmann, took off from the South Bank site and flew up the Thames and over Charing Cross and Waterloo Stations and other nearby sites before landing again at the South Bank. On landing, Mr. Profumo said that for safety reasons it seemed essential to choose a site near the river. The South Bank site seemed to be the best choice if the noise problem could be overcome. "It is quite clear," he said, "that it would be wrong to try and run . . . scheduled passenger services in the centre of London with a single-engined helicopter." Mr. Hayward, who said that he had enjoyed the experience, expressed the view that London needed not only one central rotorstation but a series of sites. Less encouraging was his uncompromising statement that the South Bank was completely ruled out since it was "needed for other purposes."

EUROPEAN AIRLINES LAST YEAR

ACCORDING to the latest available figures, presented in tabular form below, the main European airlines carried nearly 4m passengers last year. The British Corporations, whose results are shown both individually and collectively, were responsible for over 1.5m; B.E.A. flew five times as many people as B.O.A.C.

Operator	Passengers Carried	Passenger Miles Flown	Freight Carried (short tons)	Total Revenue (ton-miles)	Fleet	
					2-eng.	4-eng.
B.E.A. ...	1,337,941	356,760,085	14,107	41,896,015	126	—
B.O.A.C. ...	269,637	859,526,721	6,238	130,637,336	—	75
B.E.A. and B.O.A.C.	1,607,578	1,216,286,806	20,345	172,533,351	126	75
Air France...	982,553	796,468,650	42,200	137,957,000	37	62
K.L.M. ...	517,075	—	15,817	106,800,600	33	38
S.A.S.* ...	568,292	—	—	93,600,000	24	29
Sabena ...	—	—	—	38,900,000†	35	12
Swissair ...	292,341	—	4,270	23,800,000	17	6

* S.A.S. figures for the year ended October 1st. † Provisional figure.

DOVE IN THE EAST: Japan has now joined the long list of countries which have taken delivery of de Havilland Dove feederliners. This example was recently flown out to a large Japanese newspaper company; the Far East Aviation Co. is also receiving three, equipped as 11-seaters.

NEW "CONNIE" AIRBORNE

THE latest machine in Lockheed's Super Constellation series, the Model 1049C, made a successful first flight at Burbank on February 17th. By comparison with the Super Constellations already in service with Eastern Air Lines and T.W.A., the 1049C has Wright turbo-compound engines of 3,250 h.p. (an increase of 550 b.h.p. per engine), permitting take-off weight to be increased from 120,000 to 133,000 lb. Of nine airlines who have placed orders for this model, the first to take delivery—in about four months' time—will be K.L.M., who have ordered nine.

THE CLEARING HOUSE IN 1952

AN increase of 28 per cent in the total value of transactions handled in 1952, by comparison with the previous year, is reported by I.A.T.A.'s Clearing House in London. Most of the turnover—$218m (£78m), compared with $170m (£60.7m)—represented sales by I.A.T.A. airlines on the passenger and cargo services of one or other of the 35 member companies. By offsetting members' credit and debit accounts, the Clearing House reduced the amount of actual cash required to settle transactions to $13.8m (£4.9m)—87.6 of turnover, compared with 86.2 per cent in 1951. Companies' individual offsets were as high as 98.8 per cent—enabling one airline to settle a £105,000 account for £1,275 cash.

ANGLO-LIBYAN BILATERAL

STATED to be the first agreement of its kind made by the new kingdom of Libya, an Anglo-Libyan civil air service agreement was signed at Tripoli last Saturday, February 21st. It takes effect from the date of signature and is subject to ratification by both governments. Sabena, the Belgian airline, recently announced that it had acquired traffic rights in Libya, but whether a formal bilateral agreement is involved is not known. Presumably one of Libya's first actions as a newly joined member of I.C.A.O. (its membership is announced on page 266) will be to conclude bilateral agreements for the exchange of rights with nations whose airlines are now setting down or picking up Libyan traffic. Libya is not at present able to take advantage of the reciprocal rights implicit in such agreements, but the new sovereignty has taken the preliminary step by permitting a British independent operator to set up an internal airline, known locally as Libyan Airways. The terms of this concession allow Libya the option of taking up a majority holding of the new company's shares.

AERLINTE SERVICE POSTPONED

FOLLOWING the announcement that the C.A.B. was prepared to approve the charter of Seaboard and Western Airlines' aircraft and crews to Aerlinte, the Irish transatlantic company, for a period of only two years and not four as originally requested, Aerlinte's Shannon-New York service has been postponed until 1954. The delay will enable the service to be inaugurated with Super Constellations, four of which are due for delivery to Seaboard and Western in the summer of 1954. Originally, services by DC-4s flown by American crews but carrying Irish hostesses, were to have begun on April 1st, coinciding with An Tostal, the Irish national festival. The agreement between Seaboard and Aerlinte called for six Atlantic return flights weekly during the peak period.

C.P.A. COMET PROGRAMME

APRIL 28th is the revised date given by Canadian Pacific Airlines for the inauguration of their twice-weekly Comet service between Honolulu and Sydney *via* Canton Island, Nandi (Fiji) and Auckland. The first part of the C.P.A. Canada-Australia route—from Vancouver to Honolulu *via* San Francisco—will continue to be flown by DC-6Bs. Comets, completing the 5,800-mile journey in 12 hr 45 min, will replace DC-4s between Honolulu and Sydney. The first Comet to operate the route will

be named *Empress of Hawaii* at a ceremony to be held in Honolulu shortly before the inaugural flight.

C.P.A.'s new aircraft are Series 1A Comets, two of which are on order. By comparison with the B.O.A.C. Series 1s now in service, they have increased fuel capacity, eight extra seats, different radio equipment and full provision for water injection to improve take-off performance in hot climates. Pre-delivery flight-testing of this improved type has taken longer than was originally anticipated, and has delayed the introduction of the C.P.A. service by some six weeks. It is expected that the Canadian airline's crew training will be carried out in Australia.

K.L.M.'s 1953 FREIGHT PLANS

RECENT signs of a better balance between the volumes of freight carried in each direction across the Atlantic are reported by Mr. A. Levenson, K.L.M.'s cargo manager in North America. He attributed this trend to European recovery and the consequent gain in the weight of goods exported to the United States. Last year, he claimed, K.L.M. carried 2,000 tons of cargo from America to Europe—more than any other European airline—and its total uplift in the opposite direction was 1,500 tons. Encouraged by the prospect of lower rates and delivery of two new DC-6A freighters late this summer, the Dutch airline plans to double its cargo capacity on the North Atlantic during the coming year. This class of traffic already accounts for one-third of the company's revenue from transatlantic services. Present K.L.M. freight services are flown with DC-4s, which provide four return flights weekly between Schiphol and New York *via* Reykjavik and Gander.

B.O.A.C. does not operate any transatlantic all-freight services, although Stratocruiser and Constellation passenger services carry considerable volumes of cargo as "make-weight." As reported in *Flight* last week, the Corporation intends to apply next July for a licence to enter this growing market. Meanwhile, the Minister of Civil Aviation is considering independent companies' applications, the first of which (from Airwork, Ltd.) was provisionally approved a fortnight ago. Sabena, the Belgian airline, has already revealed interest in transatlantic freight prospects by ordering two DC-6As.

BETTER EUROPEAN SERVICES

COMPETITION between the European airlines seems likely to be at its keenest this year, with every company operating cheaper—and in many cases more frequent—services under the new I.A.T.A. fare-structure. Delivery of their Viscounts has put B.E.A. in a much better position than in previous years, and on most routes the Corporation should be able to compete on better or equal terms.

Describing the introduction of the new turboprop airliners as a "bid to make Britain supreme in European air travel," B.E.A. have announced the sequence in which Viscounts will enter regular service. *From April 19th:* daily service to Zurich (increasing to twice daily in the summer; five services weekly to Istanbul and two to Cyprus. *From June 1st:* daily service to Geneva, reducing Elizabethan time by 15 min to 2 hr 5 min. *From July 1st:* daily service to Stockholm *via* Copenhagen, reducing overall time to Stockholm from 5 hr 35 min to 4 hr 35 min.

Elizabethans will thus be released for service on other routes, competing with Convairs of, respectively, Sabena and K.L.M., between London and Brussels and London and Amsterdam; they will also operate between London and four cities in West Germany—Frankfurt, Dusseldorf, Hanover and Hamburg.

One of the most interesting announcements is that Elizabethans will inaugurate a new service between London and Ringway (Manchester), connecting international services with N.W. England. These aircraft will continue to maintain the renowned Silver Wing and other first-class services between London and Paris. All other B.E.A. international services will be at "tourist" fares, despite earlier announcements that there would also be a few first-class services to Nice from London, Manchester, Edinburgh or Glasgow and Belfast. Direct Elizabethan flights between London and Milan will be introduced; by cutting out a call at Geneva, journey-time will be reduced by 1 hr 35 min.

While an airline naturally tends to operate its aircraft on the stage-lengths best suited to the individual type, it is evident that the deployment of B.E.A.'s fleet is also being influenced by the desire to attract traffic from some of the most successful competitors. An illustration is to be found on the Zurich-Geneva routes, where, despite B.E.A.'s introduction of the Elizabethan last year, Swissair are thought to be maintaining higher load factors than the British airline. On these routes and that to Copenhagen and Stockholm, B.E.A. are making a determined effort to improve operating results, exploiting fully the passenger appeal of the Viscount, which is matched against the Convairs and DC-6Bs of Swissair and the DC-6Bs of S.A.S.

From June 22nd Air France will also begin to introduce Viscounts between Paris and Rome *via* Nice. The first leg of the journey will connect with services from London, Manchester and Birmingham. At about the same time the French airline also expects to begin direct London-Nice services with Viscounts, which in 48-seat form should prove considerably more attractive to passengers than the slower 55-seat DC-4s employed at present.

The new British airliners for Air France, the first of which is about to be delivered, will also be introduced on the Paris-Milan-Rome, Paris-Geneva and Paris-Zurich-Vienna routes, each flight being connected with an appropriate service from London.

Preliminary summer schedules published by Air France and B.E.A. show that at the peak period there will be 18 return services daily, 11 of them operated by B.E.A. French services will all be operated by DC-4s until June 9th, the date announced for the opening of an early morning Viscount flight. B.E.A., on the other hand, have not announced any intention of using their newest aircraft on this route and will continue to use *Admiral*-class Vikings as well as Elizabethans.

Incidentally, the opening of the Waterloo Air Terminal is expected to coincide with the beginning of summer schedules on April 19th. At least one airline has advised passengers that coaches will leave Waterloo 85 min before aircraft departure time. At present B.E.A. coaches leave the Kensington Terminal 60 min before aircraft leave London Airport or Northolt (65 min in the case of non-B.E.A. services). Passengers using the Air France Viscount service, for example, will consequently spend 15 min less time in the air, but 20 min more in the coach.

SHUTTLE SERVICE: Three Sikorsky S-55s of New York Airways—one of which is pictured over the George Washington Bridge—now make 16 flights daily between the neighbouring airports of Newark, La Guardia and New York International (Idlewild). Two additional flights link La Guardia with Bridgeport, Connecticut. Both mail and cargo are carried.

CIVIL AVIATION . . .

PACIFIC IMPROVEMENTS

PLANS made at the recent S.E. Asia and S. Pacific regional conference held in Melbourne are outlined in a new I.C.A.O. announcement. This meeting was one of a series being held to examine regional facilities and services in the light of new developments, including the introduction of turbine-powered aircraft. Fourteen nations were represented at Melbourne, together with delegates from the World Meteorological Association, the F.A.I., I.A.T.A. and I.F.A.L.P.A.

The I.C.A.O. announcement states that recommendations were made on the following subjects :—

Meteorology.—The revised meteorological plan recommends 530 observation posts for surface weather reporting four times daily, together with certain stations to make upper-air observations to a level of 55,000ft; 34 forecasting offices and 40 secondary offices were also found necessary for the area. A proposal was also made for the development of a special technique to be used in tropical regions for forecasting upper-air winds and weather.

Communications.—Plans include reorganization of the existing aeronautical fixed telecommunications network; increased use of radio-telephony rather than code for air-ground messages; and allocation of the new communications frequencies assigned by the International Telecommunications Union for aviation use. New flight information regions were recommended for the Cocos Islands, Biak and Taiwan, and existing F.I.R. boundaries were adjusted.

Airfields.—The meeting found that lighting of airfields for night operations is now the rule rather than the exception in the area; I.C.A.O.'s newly standardized high-intensity approach lighting system (as exemplified by the Calvert "cross-bar" lights) to aid landings at night and in foggy weather was recommended for installation at nine airfields in the two regions.

Altimeter-setting procedures.—Having been recommended for adoption in the southern portion of the Pacific region, the I.C.A.O. procedures will now be in operation in most regions of the world.

BREVITIES

THE United Kingdom of Libya has deposited its instrument of adherence to the Convention on International Civil Aviation and tomorrow (February 28th) will become the fifty-ninth member-nation of I.C.A.O.

* * *

The retiring Argentine Consul-General in Australia, Senor Echauge, said in Sydney last week that his country was anxious to open an air route to Australia across the South Pole. He added that lack of adequate communications had impaired trade between the two nations.

* * *

Curtiss-Wright flight duplicators, which are designed to reproduce in a synthetic aircraft the effect of radio navigational and approach aids, have been ordered by T.W.A. and Air France. In addition to its output of training equipment for the U.S.A.F., the Curtiss-Wright electronics division also produces DC-6B and Convair 340 flight simulators.

* * *

Lockheed Aircraft Service announces that it has acquired a 20-year lease to operate a new $2.7 m (£960,000) overhaul base which is to be constructed at Idlewild by the Port of New York Authority. The base, which is expected to be completed by the end of the year, consists of a five-bay cantilever hangar covering a total area of 90,000 sq ft—three times the space at present occupied at Idlewild by Lockheed Aircraft Service. It will be devoted to maintenance, conversion and overhaul of transport and corporation-owned aircraft.

NEARLY 250 AIRCRAFT, including 38 helicopters, performed invaluable work over Holland during the recent floods. Here is one of the four K.L.M. Dakotas which flew 41 supply-dropping missions in five days, delivering 50,000 sandbags and many tons of food.

Mr. W. P. Lipscomb, P.A.W.A. vice-president (traffic and sales), strongly criticized the existing rate structure for North Atlantic air freighting in a speech made just before the I.A.T.A. conference called to determine new rates. The air cargo business, he said, was bogged down in a morass of over 3,000 different charges for various commodities—"the whole structure has reached the point where it produces more red tape than business."

* * *

The price of a fully equipped Link trainer (with engine, airscrew and trimmed controls, wide range of instruments and D.M.E., V.O.R. and I.L.S.) was quoted as £10,000 in a recent Qantas announcement. The Australian airline has bought two new Links, one of which was delivered recently, to supplement the four trainers already used at Mascot, where 300 pilots annually receive instruction; of this total 110 are trained by Qantas on behalf of other airlines and the Department of Civil Aviation.

* * *

Mr. D. C. Tennant.

Mr. D. C. Tennant, who joined Trans-Canada Air Lines in 1938, has been appointed as the company's director of operations planning. Until recently Mr. Tennant was co-ordinator of the airline's aircraft-procurement programme and assistant director of engineering; as such, he presumably played an important part in the T.C.A. re-equipment programme (Viscounts and Super Constellations are on order).

* * *

At a recent meeting of the L.C.C. General Purposes Committee, Mr. V. Mishcon, chairman, denied that the council were opposed to proposals to operate helicopters from central London. He said that discussions between the L.C.C. and the M.C.A. on the question of providing helicopter landing sites in London were continuing.

* * *

Lord Douglas of Kirtleside, chairman of B.E.A., recently said in Copenhagen that the Corporation would be operating 90-minute helicopter services on the London-Paris route in seven or eight years' time. He added that the helicopters would seat 40 passengers each and would probably cruise at 150 m.p.h.

FORTHCOMING EVENTS

Feb. 27. A.T.A. Association: Annual Reunion Dinner.
Feb. 28. S.L.A.E.: "Aircraft Fire-protection Equipment," by R. W. J. Cockram, A.M.I.E.E., A.I.Mech.E.
Mar. 4. Royal United Service Institution: "Naval Operations in Korea," by Rear Admiral A. K. Scott-Moncrieff, C.B., C.B.E., D.S.O.
Mar. 6. Helicopter Association: Discussion on Flight-testing Experiences: contributions by C. T. D. Hosegood, S/L. W. R. Gellatly and Capt. J. A. Cameron.
Mar. 7. British Gliding Association: International Contest Victory Ball.
Mar. 7. British Interplanetary Society: "Fabrication of the Orbital Space-vehicle," by K. W. Gatland, A. M. Kunesch and A. E. Dixon.
Mar. 12. R.Ae.S.: "High-performance Jet Aircraft," by S/L. W. A. Waterton, G.M., A.F.C. (at Derby).
Mar. 14. British Interplanetary Society (Birmingham): "Artificial Satellites," by H. E. Ross.
Mar. 14. The Cranfield Society: A.G.M. and Dinner.
Mar. 18. Aircraft Recognition Society: Meeting: Guest Speaker, Prof. A. A. Hall, M.A., F.R.Ae.S.
Mar. 19. R.Ae.S.: Sixth Louis Blériot Lecture: "Making Commercial Aircraft Pay," by General Guy du Merle.
Mar. 21. Air Britain: Annual General Meeting.
Mar. 21. British Interplanetary Society (Manchester): "Establishment of a Lunar Base," by R. A. Smith.
Mar. 25. R.Ae.S. Graduates' and Students' Section: "Convertible Aircraft," by J. Shapiro, Dipl. Ing., A.F.R.Ae.S.
Mar.24-26. Institute of Metals: A.G.M., Dinner Dance and Symposium on Quality Control of Wrought Non-ferrous Metals.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

"... AND ALL WHO SAIL IN HER" : Mrs. Churchill—behind whom is Maj. Gen. C. A. L. Dunphie, managing director of Vickers-Armstrongs, Ltd., engineering and shipbuilding division—wishes God-speed to H.M.S. "Hermes" before performing the ceremony of launching the new carrier.

"Hermes" is Launched

AS we briefly recorded last week, the Royal Navy's newest light fleet carrier, H.M.S. *Hermes*, was launched by Mrs. Churchill at Vickers-Armstrongs' Barrow-in-Furness shipyard on February 16th.

Except for a slight accident to a number of spectators standing on a pile of prefabricated bulkheads, the launch proceeded without a hitch. Two of the great crowd watching the new carrier take to the water for the first time were Capt. J. A. Creed and Cdr. L. K. A. Block—both survivors of the old *Hermes*.

Speaking at a luncheon after the naming ceremony, Mr. J. P. L. Thomas, First Lord of the Admiralty, said of the ship: "When completed the new *Hermes* will be the most modern carrier in the world, incorporating much of the scientific knowledge and the research and experience which have been obtained during and since the war. No sailor today has any doubt of the value of Naval Aviation to his Service, and this fine ship will go far to maintain the record of the Royal Navy in her position as 'second to none.' A ship of this size goes far towards being a small town."

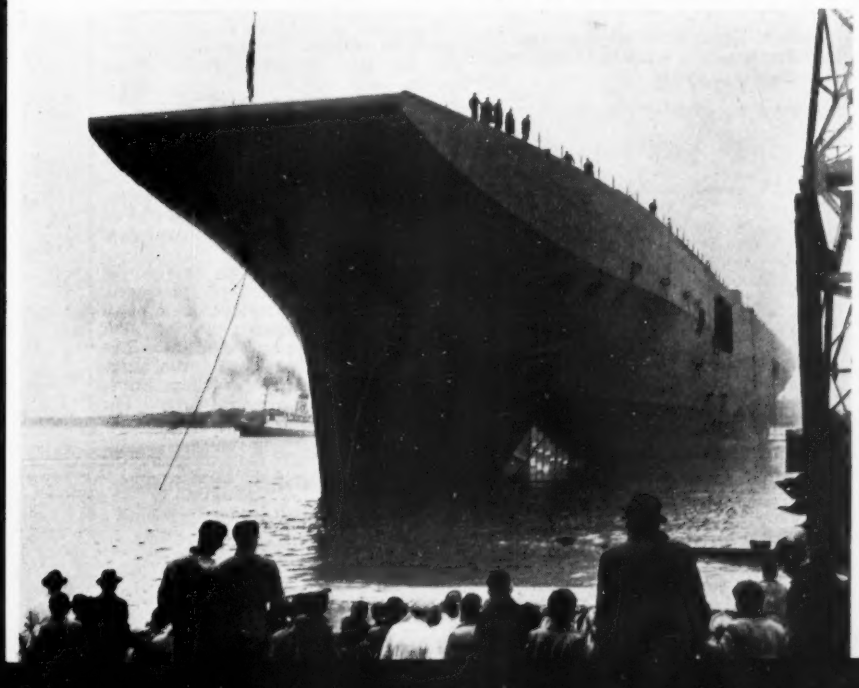
Hermes incorporates a number of new features, the most important of which are the "angled deck" and the steam-operated catapult. These two new features should help a great deal in both launching and landing aircraft at the rate required by modern warfare.

With a displacement of 18,300 tons, the *Hermes* comes into the light fleet carrier class, in contrast to, say, the *Eagle*, which is a fleet carrier of nearly 37,000 tons. The improvement to the *Hermes* will, however, so alter her operational capacity that she is expected to equal in efficiency a carrier of the old design and of some 25,000 tons.

The angled deck, the design of which was originally a joint study by Capt. D. R. Campbell, Deputy-Chief Naval Representative to the M.o.S. and Mr. L. Boddington of the R.A.E., will give a possible increase in deck-space utilization of approximately 40 per cent. It means also that a landing aircraft which fails to position itself properly can make another circuit and does not have to finish up in the crash barrier. Notes on the angled deck layout, and a diagram, appeared in *Flight* for November 21st, 1952.

Hermes is expected to have a maximum speed of 30 knots and carry a complement of 45 aircraft and approximately 1,300 men. Overall length is 741ft 6in and beam 90ft. She is the last of four ships of her class to be launched, the others being the *Centaur*, *Albion* and *Bulwark*. The first two of these carriers are expected to complete fitting-out this year.

IN HER ELEMENT : Britain's new 18,300-ton carrier H.M.S. "Hermes" at rest in the water after being launched from Vickers-Armstrongs' shipyard at Barrow-in-Furness.



Air Aide-de-camp

THE *London Gazette* for February 10th announced the Queen's approval of the appointment of Air Chief Marshal Sir John W. Baker, K.C.B., M.C., D.F.C., as Air Aide-de-Camp to Her Majesty in succession to Air Chief Marshal the Hon. Sir Ralph Cochrane, G.B.E., K C.B., A.F.C., who has retired.

Naval Appointments

IN succession to Rear-Admiral W. T. Couchman, D.S.O., O.B.E., Rear-Admiral G. Willoughby is to be Flag Officer Flying Training. The change will take place in June.

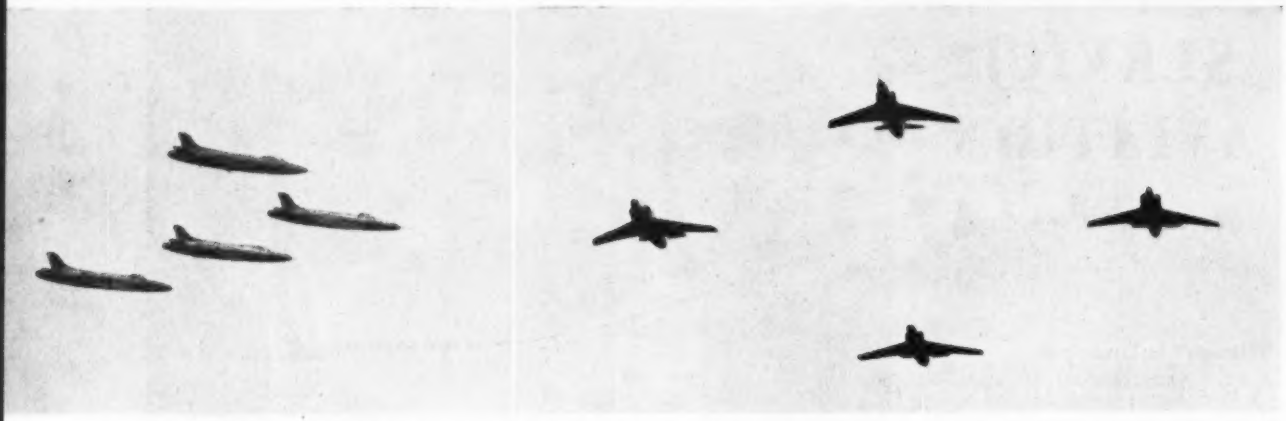
Another naval appointment is that of Instructor Captain D. C. Mackay, B.Sc., to H.M.S. *Daedalus* as Staff Meteorological Officer to Flag Officer Air (Home).

Colour Parade at Manchester

THE Queen's Colour of the Royal Air Force in the United Kingdom will be paraded in Manchester on April 1st, the 35th anniversary of the formation of the R.A.F. This will be the first occasion on which the Colour has been paraded in a provincial city. It was presented by H.M. the Queen, when Princess Elizabeth, in Hyde Park on May 20th, 1951.

The Manchester ceremony will take place at Birchfields Park, at the invitation of the Lord Mayor (Alderman Douglas Gosling, O.B.E., J.P.), and the parade will be reviewed by Field Marshal Earl Alexander of Tunis, Minister of Defence, who is a Freeman of the City of Manchester.

There will also be a fly-past, in which No. 613 (City of Manchester) Squadron, R.Aux.A.F., will take part.



SWIFT QUARTET: Providing a foretaste of a sight which—if all goes well—Fighter Command should be able to emulate this summer, these are the first photographs of a formation of Supermarine Swifts. The Swift F.1 differs considerably from the Type 541 pre-production prototypes, particularly with regard to the air intakes and canopy. One of the earlier aircraft is leading the formation on the right.

SERVICE AVIATION . . .

Southern Air Division To Move

THE headquarters of the Southern Air Division, R.N.V.R., commanded by Cdr. (A) G. McC. Rutherford, M.B.E., D.S.C., R.N.V.R., is this summer to be transferred from the R.N. Air Station, Culham to the R.A.F. Station, Benson. Three units of the Division—1832, 1832A and 1832B squadrons—will also be affected by the move.

Culham has been the home of 1832 Squadron, the largest R.N.V.R. air unit, since its formation in July, 1947, while the Air Division headquarters have been situated there since their establishment in June of last year. The proposed formation of 1832A and 1832B Squadrons was announced in September, 1952.

Director of Ground Defence

THE new Director of Ground Defence will be G/C. F. J. A. Tanner who will succeed A. Cdre. J. H. Harris C.B., C.B.E., who now becomes Senior Ground Defence Staff Officer, M.E.A.F. G/C. Tanner will assume the acting rank of air commodore.

£25 for Bedouin

THE R.A.F. is attempting to trace in the barren mountain regions of the Sinai-Desert a Bedouin nomad who gave succour to a young Meteor pilot. They want to reward this tribesman for providing food and shelter for the pilot, F/O. P. G. Greensmith, who parachuted to safety when his aircraft got into difficulties.

F/O. Greensmith was seen to eject himself from his aircraft but fellow-pilots could not say whether he had landed safely. A search by R.A.F. aircraft began immediately and a No. 205 Group desert rescue team crossed the Suez Canal and headed into the interior of the desert. The aircraft soon spotted the wreckage and radioed its position to the ground party, which, however, was forced by darkness to make camp and await the dawn.

Meanwhile Bedouin tribesmen who had pitched tents among the desert boulders reached the R.A.F. officer, who was unhurt except for a sprained ankle. They carried him down the mountainside to their camp, fed him and did what they could to relieve his pain before putting him to bed in one of their tents.

Next morning the rescue party reached the Bedouins and soon afterwards a Valetta aircraft, with jeep and landing ramp on board, landed on a disused airstrip nearby and returned with the injured man. R.A.F. officers who later inspected the wrecked Meteor declared that the Bedouins had jealously guarded every part of it. The Bedouins guided the R.A.F. land party to the scene over three miles of desert.

Later the C.O. of the unit to which F/O. Greensmith belongs led a party back into Sinai in order to reward the tribe's leader with £25—a small fortune to a Bedouin. They also took gifts of clothing for the other tribesmen. Unfortunately no trace of the leader could be found but his companions promised to scour the desert for him.

HILLERS FOR THE NAVY: The Royal Navy is to receive 20 HTE-2 Hiller helicopters, one of which is shown having final adjustments made at the Hiller factory at Palo Alto in California. Another two HTE-2s are already on the way to Britain.

The Intelligence Club

THE Air Intelligence Club has been formed to provide a focus for the trust and comradeship which have always existed in Air Intelligence, to enable present holders of Air Intelligence appointments to take advantage of the advice and experience of former specialists and to create a pool of personnel, who, having kept in touch with the problems of Air Intelligence and with each other, may be more readily available for further service in this field should the need arise. Life membership in the Club, costing 10s is open to all present and former officers (including civilians of officer status) who are serving or have served in Air Intelligence and whose candidature is approved by the committee.

One way by which the aims of the Club are furthered is by the holding of bi-annual reunions, the next of which will take place at The Paviour's Arms, Page Street, Westminster, London, S.W.1, at 1815 hours on Monday, May 11th, 1953.

The honorary Secretary, Room 7362, Air Ministry, Whitehall Gardens, London, S.W.1, will be pleased to provide full details of membership to candidates and now has available tickets, costing 6s 6d for the next reunion.

R.O.C. Long Service Medal

THE Royal Observer Corps Medal, instituted in 1950, to be awarded in recognition of 12 years' service in the corps, is now to be issued, and it is hoped that all those entitled to wear it will get them before the coronation.

The medal bears on the obverse the classical uncrowned head of the Queen, and on the reverse a representation of an Elizabethan coast-watcher holding aloft a torch and standing by a signal fire. The ribbon is of light blue with a central stripe of silver-grey and narrow dark blue stripes on either side of the central stripe. The light blue symbolizes the special connection with the Royal Air Force while the silver-grey and dark blue represent the overcast and the night sky respectively.

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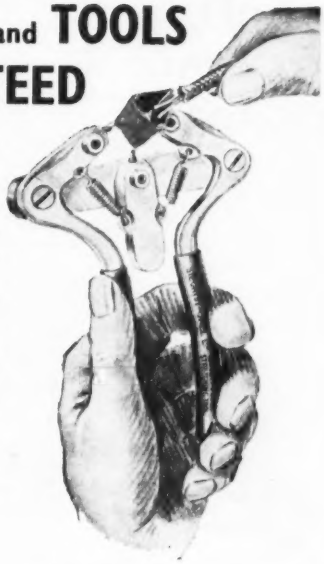

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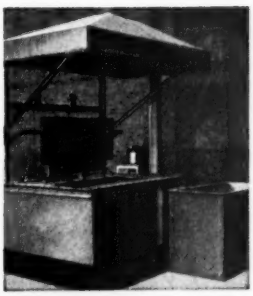

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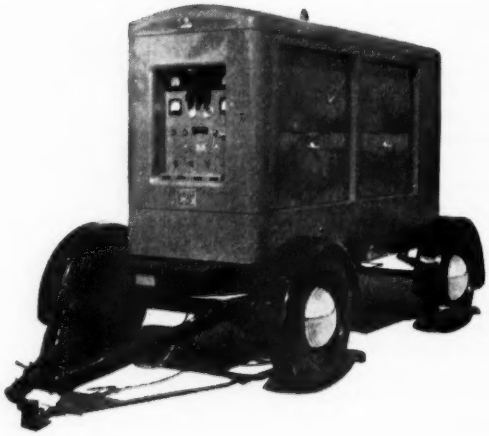

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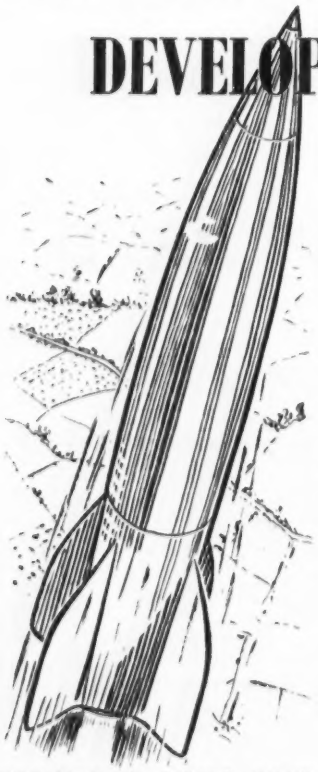

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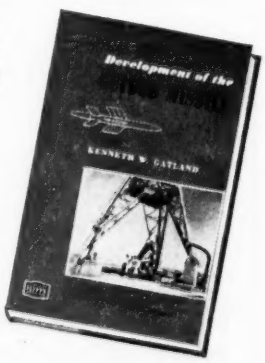

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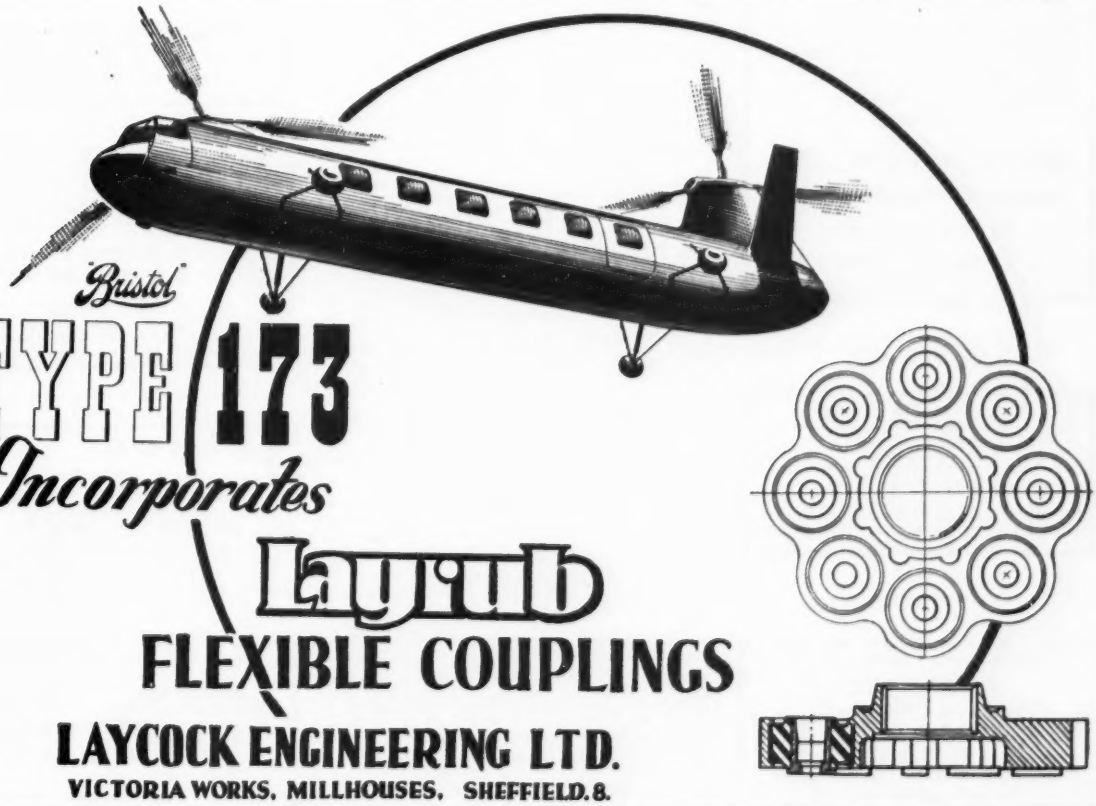

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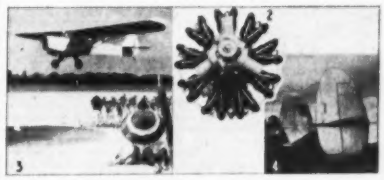

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AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services.

APPLICATION No. 166 from Don Everall (Aviation), Ltd., of Elmdon Airport, Birmingham, for a U.K. internal service with D.H. 89 aircraft for the carriage of passengers, supplementary freight and mail between Birmingham (Elmdon) and London (Northolt or London Airport) with intermediate traffic stops at Wolverhampton and Coventry (on demand) at a frequency of from one to three services daily, during the period from May 1st, 1953 to April 30th, 1960.

APPLICATION No. 167 from British Overseas Airways Corporation of Airways House, Great West Road, Brentford, Middlesex, for traffic stops at Nicosia (Cyprus) on three services per week in each direction of their existing normal scheduled services between the United Kingdom and India and points beyond.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections.

THE Council also give notice that Application No. 111 from Scottish Aviation, Ltd., of Prestwick Airport, Prestwick, Ayrshire for a U.K. internal seasonal service between London (Northolt) and Jersey (Channel Islands) with Dakota aircraft which was advertised in "The Times," "The Aeroplane" and "Flight" on November 21st, 1952 and Application No. 118 from Birkett Air Service, Ltd. of 237 Acton Lane, London W.4., for a U.K. internal seasonal service between London (Croydon) and Exeter via Southampton (on demand) with D.H. 89A aircraft which was advertised in "The Times," "The Aeroplane," and "Flight" on November 28th, 1952, have now been withdrawn. [9312

UNIVERSITY OF GLASGOW

RESEARCH FELLOWSHIP IN AERONAUTICS

APPLICATIONS are invited for a Research Fellowship in Aeronautics established by the English Electric Co. in the University of Glasgow. The Fellowship is intended to provide for a graduate in engineering or applied science, preferably about 24 to 26 years of age, who has had some experience in aircraft engineering practice, the opportunity to spend a year in advanced study and research in aeronautics. The Fellow will work under the direction of Professor W. J. Duncan, F.R.S., of the Department of Aeronautics and the Mechanics of Fluid Flow. The value of the Fellowship will be £500 per annum. Tenure will begin on October 1st, 1953. Applications (3 copies), with a statement of experience and the names of three referees, to be sent to the undersigned by March 28, 1953.

ROBT. T. HUTCHESON,
Secretary of University Court. [9311

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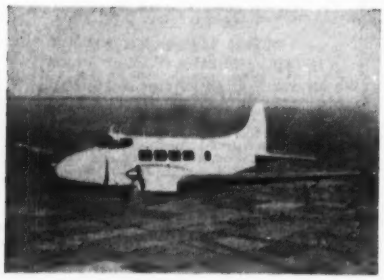

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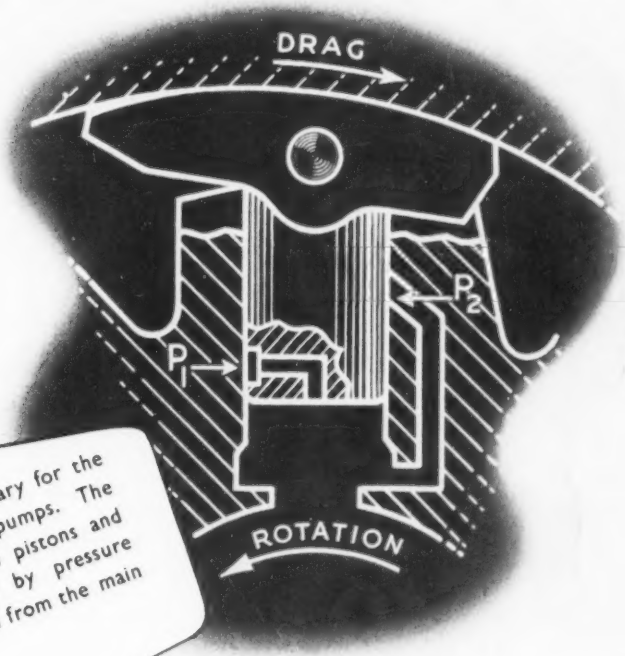

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